

SIXPENCE.

The Amateur
Photographer's
First Handbook

BY

J. H. T. Ellerbeck,

Late President of the Liverpool Amateur Photographic Society.

FIFTH EDITION.

Robt Abraham



BRADFORD:
PERCY LUND & CO., THE COUNTRY PRESS.

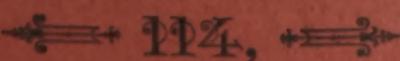
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1889.

AMATEURS 
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 NEGATIVES
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Local Scenery,
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Portraits of Celebrities,
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Artist in Photography,
PHOTOGRAPHIC PUBLISHER, ETC.,


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PUBLISHED BY THE

AMATEUR'S FIRST HANDBOOK,

A COMPLETE

Guide and Instructor

IN THE ART AND PRACTICE

OF

MODERN

DRY-PLATE PHOTOGRAPHY,

ILLUSTRATED WITH WOODCUTS.

ENLARGED, REVISED, AND WRITTEN UP TO DATE,

BY

J. H. T. ELLERBECK.

Late President of the Liverpool Amateur Photographic Society,

4TH. EDITION.

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1887.

PUBLISHER'S NOTICE.

The present edition of this popular Handbook of Photography for Amateurs, in its enlarged and improved form, has been thoroughly revised, and written up with all the latest information to date, by the Author (Mr. Ellerbeck) from whom the copyright has now been purchased by the publishers; and such arrangements are made that in future it will be procurable from any Bookseller or Photographic Dealer in Great Britain and Ireland, the European Continent, America, Africa, Australia, India, the Colonies, and wherever the English language is spoken.

LIVERPOOL,

D. H. CUSSONS.

April 30, 1887.

G. J. SMITH.

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PREFACE TO FIRST EDITION.

In writing the following short directions, I wish it to be distinctly understood that, as far as possible, all technical and scientific terms have been avoided, and only those alluded to which are necessary to the practice of Photography in its early stages. There are many instructive books published which go more fully into the science and chemistry and art of Photography. To these the advanced students must refer for higher knowledge. My aim is to teach a novice how to select and use the tools he requires, to understand the cause of failure, and therefore how to avoid them.

J. H. T. E.

PREFACE TO SECOND EDITION.

The very favourable reception this little book has met with encourages me to offer another Edition. The matter is practically the same—one error having been rectified and a few additions made.

J. H. T. E.

PREFACE TO THIRD EDITION.

A CALL for a new Edition of the handbook is caused by the sudden increase in the ranks of amateurs in Photography, and I trust those who have the opportunity of recommending it will do so, as a work to be studied before commencing, much trouble and expense may thereby be saved. One alteration only I would wish to call attention to—Plates are being now made at least twice as rapid as formerly. This must be borne in mind while calculating exposures.

J. H. T. E.

PREFACE TO PRESENT EDITION.

IN answering the call for a reprint of this little work I would wish to urge upon all Photographers, whether beginners or not, a more careful study of the artistic in their selection of the subject, though I do not pretend to be able to help except by calling their attention to the necessity for improvement in this direction. There are many Photographers who are not artists; there are many Painters who are not artists; each have the power of selection, but the pencil has the advantage over the camera in being able to add what is wanted. It therefore behoves the Photographer to be even more careful in the selection of his picture and more especially in the foreground, which often makes or mars the whole. The background is a trivial matter, compared with this, and may as well be left to take care of itself. The study of the best work of others, whether prints or paintings, will help very considerably.

Another point worthy of note is the introduction from the Continent of stained films known as orthochromatic. These plates, although slow are extremely useful, it is said for copying paintings, &c., in consequence of their counteracting to a great extent the effect of colour and giving results almost unattainable by the ordinary process.

1887

J. H. T. E.

The first difficulty in the choice of an outfit is the selection of a camera. There are many makes of cameras, and it is difficult to decide which is best. The following are the principal classes of cameras:

MODERN

DRY-PLATE PHOTOGRAPHY.

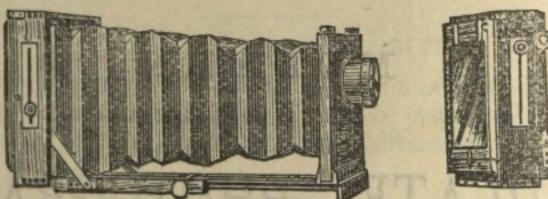
CHAPTER I.

THE SELECTION OF APPARATUS.

The first difficulty in the selection of an outfit is the choice of size for a camera. The following are the various sizes in common use, and to which, for convenience sake, it is wise to keep.

Quarter Plate ..	$4\frac{1}{4}$	by $3\frac{1}{4}$	inches.	For Cartes and Lantern Slides.
Third "	5	"	4	Small Landscape size.
Half "	$6\frac{1}{2}$	"	$4\frac{3}{4}$	For Cabinet Pictures.
	$7\frac{1}{4}$	"	$4\frac{1}{2}$	Large Stereoscopic size.
3-quarter ,,	$7\frac{1}{2}$	"	5	Larger Landscape size.
Whole "	$8\frac{1}{2}$	"	$6\frac{1}{2}$	The Grand size.
	10	"	8	} Extra large sizes.
	12	"	10	

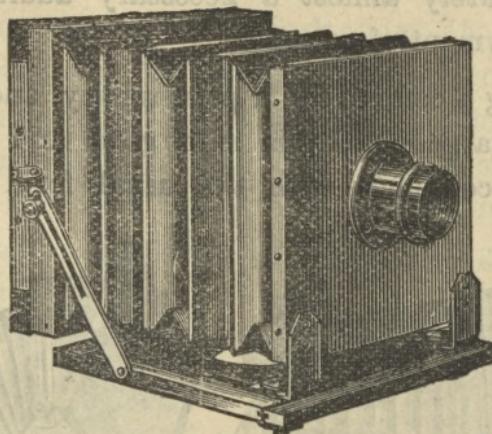
These sizes are those of the plates used, not the dimensions of the camera itself, which is, of course, larger every way. Let the beginner choose for experimental work a folding camera of this pattern—



with a leather bellows, say for 5 by 4 or half plates, light in weight and as portable as possible. Buy nothing old-fashioned; for, however cheap to begin with, it will be found dear in the end, and, as a rule, unsatisfactory throughout. The sizes now quoted are pleasing and *comfortable* ones, producing good and interesting pictures, both Landscapes and Portraits, and will not be thrown aside when larger work is attempted, and being favourite sizes they will always find a ready sale when dispensed with.¹⁰

Such a one complete, with lens, stand, and two double backs, can be bought for £3, or up to £5. If first-class workmanship the lens and stand would be extra. If the beginner cannot afford these prices, he may buy a second-hand quarter-plate camera and slide and lens for 20s., or less, and a stand can be dispensed with for home use. Or, for out-door work, a nice outfit can be had complete, with lens, camera, stand, dry plates,

chemicals,
and all re-
quisites for
producing
negatives,
and making
prints
therefrom,
for about
£2 2s., in



which this
pattern of
camera is
a good and
useful one.

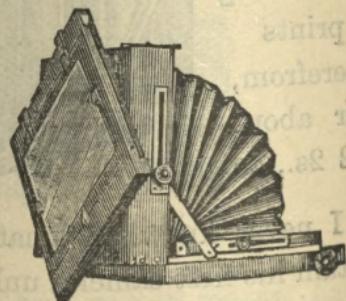
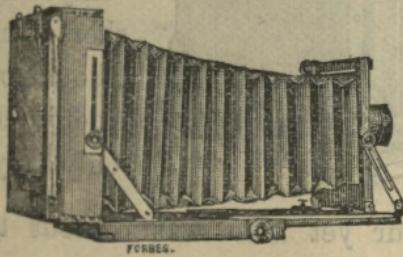
Anything
short of this
I should con-
sider to be
only a toy.

I never knew an amateur yet who was content to retain his first camera, unless it was good in quality and size. It is, therefore, false economy to buy what is not lasting in favour. For general work, a half-plate ($6\frac{1}{2}$ by $4\frac{3}{4}$) is one highly to be recommended. For landscapes it is as large as can conveniently be carried any distance, and for portraits is all that can be desired. Three double backs will be found useful, with a few carriers for holding smaller, say quarter plates, for carte-de-visite and experimental work. A *really good* outfit of this kind should be obtained for about £8 or £9. Beyond this, the weight of carrying all the impedimenta of a whole plate, or 10 by 8, which is large enough for any amateur, makes a toil of pleasure, if the scene of operations is far from home. Still, I believe, from my own experience, that the larger pictures amply repay one for the extra labour. I have carried a whole-plate camera, change-box, stand, and two dozen plates, up hill and down dale, for fifteen to twenty miles a day, weary and footsore, and yet can look back with pleasure to those very pains which, for the economist,

APPARATUS.

are unfortunately almost a necessary addition to the through enjoyment of scenery.

In choosing a camera for a permanency, and especially when of a large size, this is a good and serviceable pattern; it combines with the usual form of folding



camera an extra long extension of body, racking inward and outward, so that it is adapted for long or short focus lenses. It also admits of a divided Rectilinear Lens being used when a distant object is to be taken, without its being reduced to small dimensions on the plate; this is done by simply unscrewing the front combination of the Lens, and taking the photograph with the back combination alone, but as this arrangement makes the focal length of the Lens exactly double the original, of course it is necessary to have extra length in the Camera, and this one provides it without any material increase of bulk. It also packs up into the smallest possible compass.

The following points should be observed:—

The front should be separable, and, by screws or other means, rise and fall, with a range carrying the lens to the extreme end of the opening behind. A square camera, with reversible back, is the best.

Next, it should have a swing back; that is, the back portion, in which the dark slides fit, should move from the centre axis both upright and horizontal, in and out, so as to make the distance from the lens greater at the top than at the bottom, or at one side than the other. See also that, when these movements are made, you have the means of screwing them up tight and rigid in the desired position. A swing back is an absolute necessity, and no camera should be without. The focussing screen should be hinged to the top of the camera, and fold over when not in use; many are lost or broken for want of this precaution. The length of the camera when extended should, if possible, be at least 50 per cent. more than the length of the plate used, though it is frequently made more than double. The shutters of the dark slides must fold over when drawn out, otherwise a slight wind during exposure is apt to shake the camera, and so blur the picture. Each slide should be numbered on each side, or confusion will occur as to which plate has been exposed. To focus accurately, there should either be a rack having a thumb screw at the side to work it, or a long screw adjustment working at the end of folding base board. This latter is the best, as less liable to get out of order, but is somewhat awkward for short-sighted or long-bearded individuals. For those who wish to expose a large number, say one dozen plates in a day, I would recommend a change-box to those who can afford it, but a few extra dark slides are preferable.

Our next consideration is the lens. For landscapes, the single lens is as good as any, and by far the cheapest. If, however, the price can be afforded, by all means buy a Ross'

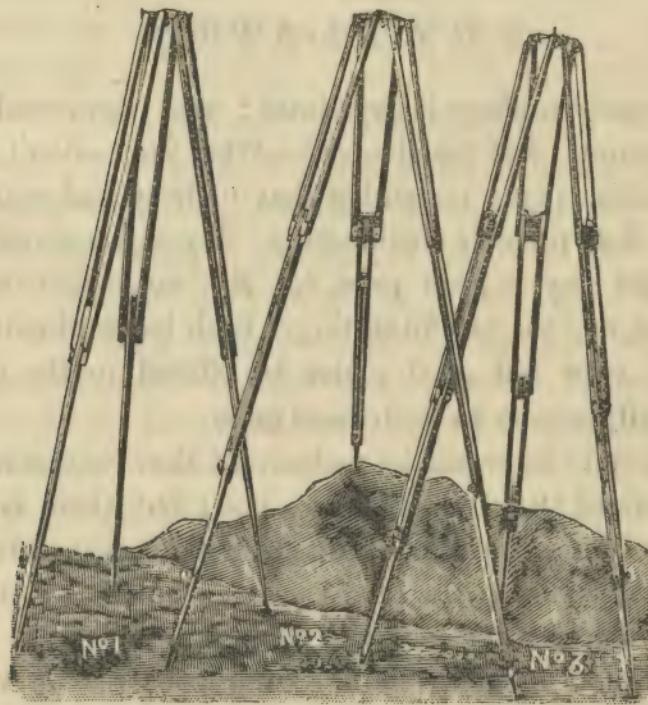
ordinary symmetrical (not a rapid one), with as long a focus as the camera will allow; that is, if the camera when fully extended measures say eight inches from the outside of front to the ground glass behind, get a lens with a focus of seven inches. This will permit of more freedom in focussing, and also in getting close to the subject, as in taking groups or portraits; for the beginner must remember that the nearer he gets to an object the longer is the focus for the picture, or the distance between the lens and the ground glass.

Other good lenses, which are equally suitable for views and portraits, are the rapid rectilinear, or Steinheil, or doublet, or by whatever name they may be called, being all of the same type. They are a double combination, and work with a larger aperture than the single lens, and therefore by letting more light through, work much quicker. These lenses, of which the first-named (Dallmeyer's rapid rectilinear) is undoubtedly the best, as it is the most expensive, are very useful for all purposes, and, though not so rapid as a portrait lens, are quick enough for any ordinary work. Portrait lenses proper, are for the amateur at least, now very little used. As will be seen later on, with a good light, the above-named lens, or its prototype, is practically instantaneous, and even in an ordinary room can be used in from three to ten seconds. If a portrait lens is wished, a French lens (which should be tried before being purchased) can be had cheap. The English makes range from £3 to £20, according to size and rapidity; £60 being, I believe, the limit, though I may be wrong.

Next, the tripod or stand. Many are made and most good. Try before purchase if possible. Set it out firmly on the ground, place your hand upon the top, and see if

it be rigid enough, no vibration, no weakness. The cost varies from 10s. 6d. to 30s., weight from 1 lb. to $4\frac{1}{2}$ lb. Don't buy one heavier than this.

Some are rigid, Alpenstock fashion, some folding as in woodcut No. 1, some sliding, as No. 2 & 3, these are the best, as on rough ground and under many conditions it enables the operator to adjust each leg to the circumstances, without altering the position of the camera, (as illustrated in woodcut No. 2) and for interiors of churches, when often one leg is on a seat and the others in a back pew, such a stand is almost indispensable.



To carry all, except the stand, some case is useful, and to protect from rain; many prefer a stiff leather one; I

find a waterproof strong canvas one, large enough to hold camera and three double backs, most convenient. It should have a good broad strap for the shoulder.

If a leather case is used, have spaces divided for each piece of apparatus, so that you know on starting that all is there :—camera, lenses, dark slides, top of stand and screw and black cloth, then nothing will be forgotten.

CHAPTER II.

DRY PLATES.

The next purchase is dry plates ; and here a real difficulty occurs. Let me give one advice only—don't judge by advertisement; remember that “cheap and nasty” is a more than possible combination. If you want good work you must pay a good price for it; no maker always succeeds, and the careful testing of each batch of emulsion, so that none but good plates be offered to the public, necessarily means an enhanced price.

Let it not, however, be understood that because a plate is low-priced that it is therefore bad ; but there is more chance of higher-priced plates being good because no maker would ask a high price for his plates unless he thought they would, in a repeat order, command it.

I will not make invidious comparisons of the various makes in the market, but simply state that in my hands *all* the higher-priced plates have proved good and workable, and some also of the cheaper ones; but let the

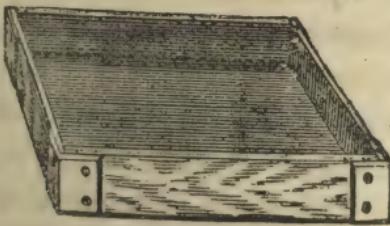
amateur please himself in this matter, or else trust to the judgement of others more practiced in the art (as indeed for all else in the commencement), and buy a few only, and let those be small ones ; for with the most explicit directions it is doubtful if success be obtained without occasional failure, and it is through failures we learn. The modern dry plates are sold at from 1s. to 2s. per dozen for quarter plates ; other sizes in proportion. There are also paper films cut to the usual sizes and made in rolls, adapted for a special form of "Roller Slides," which, although never so perfect as glass plates, will find favour with many who object to the weight of the latter and who can afford the more costly mechanism necessary. To my mind the perfection of paper films will never be obtained until the negative itself can be transferred to glass, separate from the paper support, as first suggested by me some years ago. This is already done, to a certain extent, in what are called "stripping films," but the present method of transfer has an element of uncertainty about it which would deter many from trusting valuable and often unreplacable negatives to its tender mercies. What is now done could have been done years ago, and we must look for improvements instead of adaptations, before relying upon new methods, although the attempt so long delayed is a step in the right direction.

CHAPTER III.

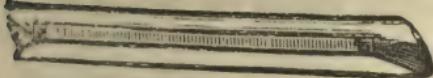
THE DARK ROOM & ITS CONTENTS.

For development and for changing plates this is of great importance. In the selection of a room for this purpose

each person must be guided by the circumstances of the house in which he resides. If he can build one so much the better; if not, choose an airy room with a small window, and with the door leading into another room, thereby lessening the probability of direct white light entering the dark room. I monopolise the butler's pantry, but few, except bachelors, are allowed so much liberty, and they even are often more henpecked than their better brethren, I mean those who have someone to look after their buttons. Whatever spot is fixed upon let it be, if possible, provided with a tap and sink, with an overflow. If such cannot be had, you should purchase a flexible tray or sink like this—



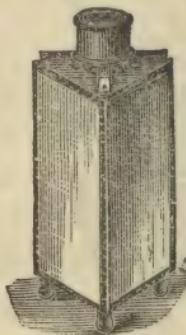
Open for use



Closed for packing.

with the outflow fitted for attaching an India-rubber tube. The window, if too large, can be covered over with brown paper; or only a hole (say two feet square) or an ordinary size pane, cut out for inserting a piece of ruby and orange glass for obstructing all hurtful light. Oiled silk, of good colour, or orange paper may be employed, but still better is a new fabric of a yellow chrome tint, called "canary medium," which can be had in large sheets or about 3d. or 4d. each, this may be pasted inside the

window, or a framework of wood, fitted into the window, can be easily and cheaply made by any rough joiner, and hooked on to a nail in the wall when not required. A very handy plan is to glaze the window with a pane of good deep orange glass, over which fix a blind made of Turkey red twill, to pull up and down as required ; this combination gives plenty of light and good in quality. If the room be darkened entirely, or used at night, a lamp is wanted. This is an ordinary pattern of ruby lamp, burning mineral oil, there is also one made from a hock bottle, fitted up so as to burn a candle ; it is safe, handy, and economical, costing about 2s. 6d.



Ruby Lamp.

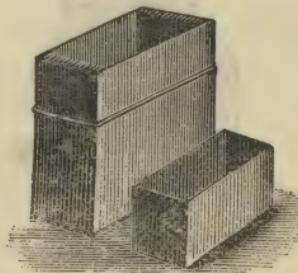
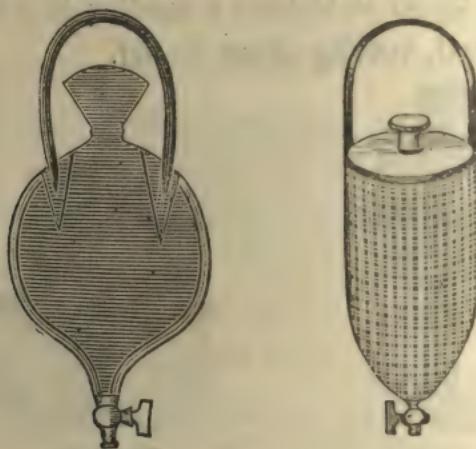


Plate Box.

See that no white light escapes through the fittings. Mine is made of a four-sided ship's lamp, with two sides replaced by dark ruby glass, the other by deep orange. This throws a flood of light into the room, and enables the operator to see where his chemicals are. The light through the ruby glass side only falls on the plates during or before development, and does no harm, nor does the yellow light when reflected from the walls of the room, though it would if it fell direct upon the plates. If possible let the eyes be protected from the direct rays of the lamp ; you will

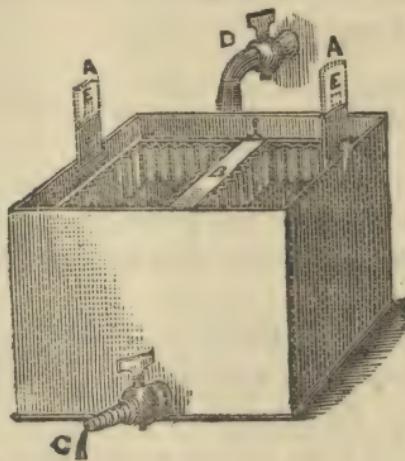
then be better able to see the effects of development. The above woodcut shows a simple grooved plate box, which is very handy for carrying 1 dozen dry plates.

If a direct supply of water cannot be obtained, a large stone jar, such as often used for beer, or an old water filter, with a tap at the foot, is a good substitute. India-rubber water bottles and water bags to suspend, fitted with a regulating brass tap, can be had from the dealers for about 6s. to 10s.



In this case it is better to complete all the final washings where a more plentiful supply may be had, as it is difficult to give too much water to a negative after fixing, when the light has no further action upon it. For this purpose, a strong zinc washing trough, fitted with grooves for containing negatives of various sizes, can be had at a very moderate price, I think about 9s., and in it you can place all your developed negatives under the water tap on the sink in the back kitchen, leaving it to flow all night without any danger of injury; then your negatives will be

perfectly washed by the morning. This is the form of it—



You can have the outflow either by a tap or a syphon; I prefer the latter. If the force of water is too great for safety, as when the cistern supply is of great height, a piece of India-rubber tubing over the tap, of larger dimensions than the tap itself, will break its force, and do no injury to the soft gelatine film of the negative.

For development, trays of the requisite size are to be had of ebonite, papier mache, porcelain, metal or wood. The economist can make them of either of the two latter materials, and, if well black-varnished, will answer very well. Ebonite, or papier mache, are the best, but, being breakable, must be used carefully. I have four in use, one for development, two for fixing, one for clearing. For these two latter operations, the old baths and dippers, such as were used for sensitising wet plates, are luxurious, and act better by a greater change or motion being given to liquid, but they are more expensive to buy, though metal ones can be made at a trifling cost.

Of chemicals, the following would at first be sufficient, larger quantities may of course be purchased, as all except the pyro. will keep.

1 oz. Pyrogallic Acid ..	1/6	1 oz. Perchloride of Mercury, 6d.
1 oz. Bromide of Potassium	3d.	1 tube of Chloride of Gold .. 2s.
2 oz. Liquor Ammonia	8s0 2d.	1 oz. Bi-carbonate of Soda .. 1d.
1 oz. Citric Acid ..	.. 3d.	1 oz. Acetate of Soda 2d.
1 oz. Alum Powder ..	.. 1d.	2 lbs. Hypo Sulphite 6d.

I have put prices to these for reference, but, of course, they are not constant, and the larger the quantity the lower the price. Two dropping bottles, 1s. or 1s. 6d. each, will be useful. A 2 oz. measure marked with drams, and a few common cups, pint jug, two or three pint bottles, as many of 2 oz., and a camel's-hair flat brush, 1 inch or two inch will complete the necessities of the dark room, unless the operator is wishful to save his fingers from being stained slightly, when a small curved ebonite hook, made for the purpose, can be purchased at the dealers for a few pence, which will enable him to lift the plates out of the solutions without wetting the skin.

And now before inserting the plate in the slide, brush it lightly over with a soft, clean cloth, or a camel's-hair brush, as each speck of dirt is a flaw, and be careful to place the prepared or dull side of the plate towards the draw shutter; also that, when closing the dark slide it is properly fastened by the catches attached, as, if the smallest trace of light gets in, it spoils all.

CHAPTER IV.

THE SUBJECT.

Most beginners, I fancy, practice on figure studies, a friend or relative, who wants to be immortalised. This is a mistake. Don't get into bad repute by confessing failure; therefore practice on any inanimate body, whether house or landscape, and you need not show results unless you like. In figure studies also, so much depends for the best results upon the lighting, and this requires more study than you have at present given. Practice at home, do the backyard, the outhouse, the other side of the street, anything until you know (as after the exposure of a few plates I hope you will know), that you have learnt the right time to give, and also the right mode of development. Then take your friends in or your camera out, and you will come back happy in anticipation. For outdoor work, if not bashful (and if you are, you had better get over it quickly), you need not go far for a picture. There are few villages that have not a picturesque corner, few lanes without attraction, few fields without a tree, a pit or a broken fence. The grandest subjects give frequently the worst results. A corner, a little bit of wood and water, that an Alpine tourist would pass unnoticed, will often give you a picture to be proud of. I cannot, in this short space, give directions how or where to find subjects. If you have no artistic training, nor the taste which forms the artist, look at the work of others and go and do likewise.

In photographing figures, a plain background is the best universal one. You can make a very good one with a blanket, or of a sheet of brown paper, which can be bought

five feet wide and any length required. This nailed up against a dead wall, or hung on a pole, is first class. If you can afford it, buy a proper one, made of flexible stout material, called "Empire Patent Cloth," which can be had from any dealer in photographic materials, in a variety of tints, and to almost any dimensions. A very useful size for the amateur is about 8 ft. by 7 ft.; this mounted on a suitable roller would cost 30s. Avoid fancy painted backgrounds, unless you are going in for a properly and fully fitted studio, and then you may indulge in such if you wish. A garden always supplies a good background. Ivy, trailing plants, a tree, the doorway in a greenhouse, all can be brought into requisition; but if you have a brick wall, cover it up somehow.

Indoors, good pictures may be taken, but, for want of space, the features are often distorted by being obliged to bring the lens so near the figure.

Avoid horizontal straight lines, upright ones you cannot, but these must be properly distributed or they will spoil the result.

There is no reason why amateurs should not produce as good work as professionals, even on their own ground, but the ground must be prepared by study.

If groups are attempted, don't let all stand in a row, the centre figure should be the highest (or one near the centre), and the outside one lower than its neighbour, the others as far as possible taking the pyramidal form. More minute directions would only confuse. Consult a book of good engravings, and you will get hints enough for many pictures from better masters than I.

For properly lighting a sitter in or out of a studio. I cannot do better than quote from a pamphlet issued by M. Klary, of Algiers, in which he describes a system of lighting the sitter, adopted in many American Studios, by means of a coloured head-screen and a reflector, avoiding the necessity for blinds or curtains. The embodiment of M. Klary's system, from which some valuable hints may be gained, is given in a condensed form by Messrs. Cussons, of Liverpool, as follows:—

"Light and shade giving us all our effects in Photography, it is necessary that they be balanced in accurate proportions; the time of exposure sufficient to set forth the lighting, and the development adjusted according to the exposure. It is important that the lighting of a face and figure should be balanced in such a way, that the contrasts may not be simply *black* and *white*, but a soft gradation of all the intermediate tones, so as to produce an artistic picture."

"Of the three lights used in the studio, the *diffused* may be employed in the greater quantity, the *reflected* must be more restrained, and the *direct* used more sparingly and judiciously. The position of the sitter should be *under* the principal or strongest light. It is best to employ a soft and slightly diffused light combining in due proportions the top and side. This is readily obtained by use of a head screen. It should be placed by the side of the sitter, nearest to the light, and of course outside the focus of the desired picture. It must be elevated above the head, raised or lowered and turned to the required angle, until the operator observes the true and best effect upon the shades and lines of the face.

There will now be seen a generally diffused light over the whole of the figure, but a little predominant on the side nearest the light ; if the eyes are sunk deeply, lower the screen a little and move it slightly towards the shaded side of the face ; it will thus increase the top light and bring the face into bold relief ; the shaded side, though slightly darker than the other, will remain soft and full of detail."

" It is necessary to soften the edges of the shadows, in case of need, with a pure and delicate reflected light, this is done very readily by means of a reflector. It should be of the concave form turned towards the sitter in such a manner as to throw a concentrated light upon that part of the face under and behind the eye, as well as the darker portions of the neck, you will thus avoid the spot of reflected light appearing in the eye.

" For lighting *a la Rembrandt* do not change the position of the face, but move your Camera so as to obtain a view of the other cheek, and with some slight modifications of the head screen, this lighting will be as perfectly rendered as the other. It is not here necessary to use the reflector, the head screen alone will regulate the top light, which must be used sparingly, so that it does not fall upon the points where the middle tones are wanted."

When out afield having selected your subject, see that the stand is firm on the ground ; if on a smooth surface it may slip, if on a soft soil it may sink, see to both chances and that the camera is firm on the stand. Next throw the black cloth over the camera and over your head, and screw out the apparatus until, having taken the cap off the lens, you find the image upside down, coming up sharply ; then take a magnifier and see that it is perfectly sharp,

microscopically so. If a figure, focus for the eyes; if a landscape, the middle distance; use the magnifier in the centre of the picture (it will probably be sharp all over, only when the stop is inserted). Now see that the camera is perfectly level in each direction; if not so, that is, if pointed downwards or upwards, the picture is distorted, and the walls of any building will not be parallel but running to a point in a most distressing manner. If the building be tall, or the foreground obtrusive, raise the front containing the lens until the object be removed, or until the top of the building be visible on the plate. If necessary for this, turn the camera on its side and try again. For churches and figures this is frequently the best position. As I have said in the case of a landscape, focus for the middle distance, then use the swing back so as to increase the distance between the lens and the upper portion of the glass, by this means you will get the foreground also as sharp as the rest.

It is frequently considered artistic to have the distance out of focus and hazy. The atmosphere in this country generally effects this without making it so purposely. Always look at your subject with one eye only, thus you get a better idea how it will look when imaged by the one eye of the lens. Many bits which look extremely pretty with both eyes, or in the stereoscope, which is identical in result, are very tame as a single picture.

And here a few words on the lighting of the view will not be out of place. Never take a landscape with the sun or bright light shining directly into the lens, or fog will result. The best light is a cross light, that is, coming from either right or left side, but avoid, if possible, a strong cross light falling between the lens and the subject. Buildings

require a high light. Landscapes almost at any time of the day. Trees and foliage frequently shew best illuminated by a low evening sun, when the shadows are long and the trunks well lit. Distances, if at all lost in mist, will be probably lost altogether in the finished print.

Foliage, when there are deep shadows, will very frequently be taken with best advantage without sun, and there is also less chance of wind, and for perfect results with close distance it is necessary to avoid the least suspicion of this, while, for large distant views, wind has little or no effect.

CHAPTER V.

THE EXPOSURE.

Having now selected and focussed your picture, whether figure or view, see that the screws are tightened, fold over the ground glass and insert the slide containing the plate, fasten in its place with catch, draw out the shutter; cover all over with the cloth, and by taking the cap off gently and quietly, expose—for how long? The lens maker gives you no information; the platemaker confuses you. If you ask him he tells you they are twenty times as quick as wet plates; but as nobody knows, or cares to know, how quick a wet plate is, you are not very much wiser. Then he says they are instantaneous. What does that mean? I have one lens I can take a picture with in a $\frac{1}{250}$ of a second. Is this instantaneous? No. Yet I can take moving objects with a rapid rectilinear, the shortest exposure with which to get a good picture, is $\frac{1}{50}$ th of a second, and I have taken

children playing in a $\frac{1}{4}$ of a second. Then, says the maker, cap off and on. With what lens? And you get no satisfactory reply; and until makers are forced by public opinion to mark their plates so that any who buy may know how quick they are, so long will this uncertainty last. Several makers have done so, I hope the remainder will follow their example. But, even when so marked, it will depend entirely on the lens, the stop, and the light, three varying quantities. I will devote this chapter to directions as to finding the relative exposure necessary for various subjects, taking into consideration the lenses you may have, the amount of light at command, the plates you may use, and other varying conditions.

To illustrate the mode of calculation of the former, we will suppose that the lens is one of 5-inch focus, and if a Rapid Rectilinear, or Symmetrical, or other lens of this type, it is always supplied with a set of diaphragms (or stops) of various central apertures smaller than the opening of the Lens, to be inserted as required. Now take each stop and measure the opening accurately. We will also suppose that these are four measuring $\frac{1}{8}$ th, $\frac{3}{16}$ th $\frac{1}{4}$ and $\frac{1}{2}$ inch. Divide the focus 5 by the size of the stops $\frac{1}{8}$ th, &c. $5 \cdot \frac{1}{8} = 40$, or $\frac{F}{40}$ as is generally called, meaning that the focus divided by 40 is the size of that particular stop. The next yields 27 nearly; the next 20; the largest 10. These stops are therefore $\frac{F}{40}, \frac{F}{27}, \frac{F}{20}, \frac{F}{10}$. As these represent the diameter of the stops, to obtain the relative amount of light which passes through each aperture, the figures must be squared. $40 \times 40 = 1600$, $27 \times 27 = 729$, $20 \times 20 = 400$, $10 \times 10 = 100$. These figures represent in inverse ratio the speed with which, under the same circumstances, an exposure may be

made. Thus, if the largest stop requires one second, the next will require 2 seconds, the next 4 seconds, the next 8, and the smallest 16. If you make a list of these, and keep it for reference, you will never be at a loss.

Now as a general rule, and as a guide to those who have never before exposed a plate, I may remark that F 40, that is a lens and stop, the latter $\frac{1}{40}$ th the length of focus, will require an exposure of two seconds with an ordinary plate on a landscape bathed in sunshine, but as the rapidity of each make of plate and the development varies, that standard must not be relied upon permanently, but let each test for himself whether with the particular plates he uses this be right or no. Do this after practising on a few plates to get accustomed to the development. Proceed as follows: Insert a plate as before directed in the camera, but instead of pulling the shutter out fully, draw it out only one-third of the length, and expose one second by taking the cap off for that length of time; then when the cap is on again, draw out the shutter for another third of the space, and expose that portion for another second; then again for another after pulling out the shutter to its full extent. You now have a plate exposed three seconds, two seconds, and one second. This is then carefully developed, and when complete you can judge which is the portion best exposed, and this made a note of will be a guide for future work. Of course, if the lens is slower, if the stop be small or the focus large, or in any way the F, as mentioned above, is divided by a greater number than 40, then you must increase the exposures to 2, 3, 4, or 3, 5, 7 seconds, or whatever the proportion of these dividers when squared may be; also the experiment must be made under the same conditions

of light, namely, sunshine (unless you have thoroughly mastered the next chapter).

Having fixed this one exposure as right, we will say, still for arguments sake, that you find the middle portion, which had two seconds, was the most brilliant, and at the same time, full of detail and prints best, calculate now the time necessary for the other stops, and, if you have them, for other lenses and their stops. It is all a question of simple arithmetic, nothing more, thus, F 40, or squared 1600, takes two seconds, what will say F 10 take? Square 10=100 and say as 1600 is to 100, so is two seconds to $\frac{1}{8}$ th. And you know therefore that the large stop represented by F 10, will, *under the same conditions*, take $\frac{7}{8}$ ths, when the smaller required two seconds, and so on with all other stops and lenses. Now make a table in your note book for handy reference, thus:—Mr. Blank's lens 5in. focus.

$$\text{Stop } 1 = \frac{F}{1} = \frac{1}{8} \text{ sec. Sun.}$$

$$\text{,, } 2 = \frac{F}{20} = \frac{1}{2} \text{ , , }$$

$$\text{,, } 3 = \frac{F}{37} = 1 \text{ , , }$$

$$\text{,, } 4 = \frac{F}{40} = 2 \text{ , , }$$

The following is my own mem. of the Rapid Rectilinear 13-in. focus, size 10×8 .

$$\text{Stop } \times = \frac{F}{8} = \frac{1}{12} \text{ sec.}$$

$$\text{,, } 1 = \frac{F}{10} = \frac{1}{8} \text{ , , }$$

$$\text{,, } 2 = \frac{F}{12} = \frac{1}{6} \text{ , , }$$

$$\text{,, } 3 = \frac{F}{16} = \frac{1}{3} \text{ , , }$$

$$\text{,, } 4 = \frac{F}{24} = \frac{2}{3} \text{ , , }$$

$$\text{,, } 5 = \frac{F}{32} = 1\frac{1}{3} \text{ , , }$$

You have now data to go upon which, if the light itself was always fixed, and you always worked out of doors,

would be all that is required ; but, unfortunately, clouds will intervene and shadows creep on one unawares, that it is impossible often to have any idea as to how much actinic light is left to illuminate the view or the object to be imaged. A practised photographer can judge by his experience and by the appearance of the image on the ground glass how long to give, but at best this is only an accurate guess, and the beginner cannot hope to succeed without help.

Now as to the light at different times of the year: In May, June, July, and August we have the best actinic light and therefore in these months you may give the shortest exposures ; in March, April, September, and October, the light being less actinic, you may double that exposure ; in January, February, November, and December, when the light is weakest, you may treble the exposure. You must also bear in mind the hour of the day, thus, from 9 a.m. to 4 p.m. in summer, and from 11 a.m. to 2 p.m. in winter, you may calculate upon having the best light, before or after these hours you may safely double the time of exposure.

Next as to Dry Plates :—I must explain that the principal makers have adopted as a standard for testing them, a Sensitometer, which is so devised that under normal conditions it registers upon the plate tested a number which denotes the sensitiveness in various degrees, ranging from No. 1 (the lowest) to No. 25 (the highest); by this test we may consider a plate registering from No. 1 to 10 as being of ordinary rapidity (comparatively slow), from No. 10 to 15 as being *rapid*, from No. 15 to 20 as *extra rapid*, and

from No. 20 to 25 as *instantaneous*, i.e., suitable for drop shutter work.

A little instrument called an "Actinometer," first devised for Carbon printing, is sometimes very useful in calculating a probable exposure out of doors. It consists of a small circular box, not a half inch thick, containing a piece of sensitive paper on a roller; the end of this is pulled out, a portion only being shown in passing under a circle surrounded by tints of various depths; these tints represent the color, or rather depth of color, taken by the paper when exposed to sunshine for 10, 20, 30 up to 60 seconds. I will explain how it is used for our purpose. You will remember that the standard exposures from which you have calculated your figures were given in sunshine. Now if at the same time and condition you expose your actinometer to the source of the light, viz., the sun, you will find that I have stated the first tint is reached in 10 seconds, the second in 20, the third in 30. Now we will suppose that the weather is clouded, or that you are inside a room or under the shadow of trees in a deep valley, or any of the varying conditions of a photographic life, you expose the actinometer to the source of the light, whether a window or the clouds, *always in the same condition as the subject to be taken*, and you find that, to get tint 3, instead of $\frac{1}{2}$ a minute, as before, it now takes say 5 minutes. The inference is obvious, you have only one-tenth of the light to deal with and you must give ten times as long as you would give under the better circumstances, that is, as the figures you have previously noted down—and you will most probably have given the exposure required. I say most probably, because in many subjects there are other conditions

THE EXPOSURE.

which have to be studied and which may influence the exposure.

I will now give a Table of relative exposures for various subjects, based upon the foregoing instruction and practical experience, which will serve as a fair guide to the beginner, although it must not be taken as an *absolute* one. In compiling it I take a Rapid Rectilinear Lens, using the first (or largest) diaphragm, which is the full aperture, working at F8 in a noonday light at midsummer, and from this I calculate approximate exposures necessary upon extra rapid and instantaneous plates of any good make—

SUBJECT.	IN SUNLIGHT.		DIFFUSED LIGHT.	
	Ex. Rapid.	Instants.	Ex. Rapid.	Instants.
For Sea Views and Sky ..	$\frac{1}{2}$ sec.	1/50 sec.	$\frac{1}{2}$ sec.	1/20 sec.
An Open Landscape ..	1 "	$\frac{1}{4}$ "	2 "	$\frac{1}{2}$ "
Do. with foliage and light coloured Buildings	2 "	$\frac{3}{4}$ "	4 "	$1\frac{1}{2}$ "
Do. with Dark Buildings ..	4 "	$1\frac{1}{2}$ "	8 "	3 "
Woods, and heavy Foliage ..	8 "	3 "	15 "	5 "
Figures, or Groups, outdoor ..	4 "	$1\frac{1}{2}$ "	8 "	3 "
Portraits in a room with good window	8 "	3 "	15 "	5 "
Interior Views of ordinary rooms	5 mir.	2 min.	15 min.	5 min.
Interiors of Churches, &c., with stained-glass windows ..	30 "	10 "	1 hour.	20 "

An open, *distant*, landscape or sea view, will take but half the time of a *close* one. A near view, all fore ground, and perhaps composed of nothing but foliage will frequently take longer than the standard here given.

These are matters for which no rule, hard and fast, can be made, but in all, if the *source* of the light varies, the actinometer will tell you to what extent. The rest must be left to your own judgment.

Having now your note book and this table to refer to and the actinometer to measure the light, you need depend upon none for guidance in the matter of exposure; and there is no reason why with care *every* plate should not be correct in this particular. Once master this thoroughly, and more than half your troubles are over; for the bulk of the annoyance, trouble, and loss connected with Photography is dependent upon either under or over exposure in the first place.

CHAPTER IV.

THE DEVELOPMENT.

This is perhaps one of the pleasantest operations to the enthusiast, if there is the expectation of good results, which ought always to be the case.

Each box of plates sent out contains full instructions as to the solutions required and their use, and, as a rule, it is better to follow them closely. These vary so much that I cannot well criticise them here, nor do I wish to do so. Each maker ought to know best the treatment his own plates require in order to produce the best results; and it by no means follows that the development which is eminently successful for one class of plates will do for another. I can therefore only give the plan I have myself adopted, and by studying the reasons given, the reader will learn how to adapt its principles (not its details) to the mode he may have to employ with his own plates.

The chemicals in common use are pyrogallic acid (generally known as pyro.), bromide of potassium and

THE DEVELOPMENT.

ammonia. You may find these under various names, and in various qualities, as is the case with most chemicals, thus bromide of potassium is called potassium bromide, carbonate of soda is sodic carb. and so on ; the purchase of these substances from first-class houses will overcome any difficulty on that score, and one bit of advice I must add—always buy the *best* chemicals obtainable, and never be tempted with the cheap if you wish to produce good results in your work.

The pyro. can be kept either in its solid form or in solution. The latter may be in alcohol or water.

(A) Add to 1 oz. of pyro. 5 oz. of alchol or spirits of wine or methylated spirits, and when dissolved add 1 oz. of glycerine, and well mix :—or

(B) Dissolve 40 grains of citric acid in 6 oz. of water, and then add this to 1 oz. of pyro.

In each case you have 1 oz. of pyro. dissolved in 6 oz. of solution, and therefore 1 grain of pyro. is contained in 6 minims of solution, or 1 dram of solution holds 10 grains of pyro., thus you can measure out easily any required quantity. I may here mention that a drop of a water solution is nearly equal to 1 minim, but that one drop of an alcoholic solution is equal to only half a minim, and that a drop of the same material is always the same size, let it come from a wide or narrow opening. This is worth remembering.

I prefer myself to keep the pyro. in a solid state, and weigh out the quantity as wanted ; but this is entirely a matter of choice. Pyrogallic acid will not keep indefinitely, in the solid form it discolors, also in glycerine and alcohol, while in water, it is least reliable for a lengthened period,

though best for a short one. The bromide should always be kept in solution. I use 120 grains to 1 oz. water. The ammonia is best diluted with an equal quantity of water.

To commence, mix sufficient pyro. for as many plates as you are likely to develope at once, it saves time. For a quarter plate or 5 by 4, take 1 oz. of water, 2 grains of solid pyro. (or 12 minims of solution), and 1 drop of bromide (containing $\frac{1}{2}$ grain) mix this in a cup. Take the plate out of the slide and lay it face upwards in a tray and pour over it the mixture from the cup. Take a large camel-hair brush and pass it gently over the plate to clear away any air bubbles that may stick to it, and see that the whole is well covered by the developer; if it is not, use more of the same solution until it is. Add 1 drop of ammonia to the cup and pour back the solution from the plate into the cup, mix and pour back, but this time and afterwards it must be poured on with a sweeping motion, commencing at one corner of the plate and carrying it quickly on to the opposite end, at the same time tilting the whole so as to allow the solution to flow rapidly over the plate. If this is not carefully done, the developer acts on one part of the plate, while the other is left free, and thus lines occur which do not add to the beauty of the picture. Then wait awhile, rocking the dish so as to keep the solution in constant motion; if no change occurs, or if only the high lights shew up as a grey patch, such as the sky, add another drop of ammonia to the cup; again mix and flow over, always with the same precautions, and repeat this as often as necessary, adding for every three drops of ammonia 1 drop extra of bromide. If the plate is rightly exposed, 8 or 10 drops of

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ammonia will be found to be enough to bring out all details and full density.

You will find the plate gradually going darker in the portions which first appeared, then details will come where it was white, and at last it will appear to veil all over, and you will only with difficulty see an image at all. Now lift it out of the tray and hold it up to the ruby light. It ought to appear very dark, almost opaque, except here and there, and a trace of the picture, especially the highest lighted portions, may be visible at the back of the plate, if this is so, it is done.

If you find it still thin and you can see all the details plainly all over the plate, it is probably over exposed. In this case, throw the developer away, and without washing, add at once a fresh lot of pyro., and let it act until density be obtained. It may be necessary to add another 2 grains of pyro. to the solution to strengthen it sufficiently.

Another condition of the plate is under exposure, when the sky or high lights grow dense before any details beyond the most prominent show up of all. In this case add an equal amount of water and more ammonia to the developer in the cup, this will prevent the plate getting too dense, while it allows the ammonia to bring out details, then, when all details come up, but thin, add more pyrogallic to give density to the whole.

If, again, when the first dose of ammonia is added, the image flashes out quickly all over, it is evident it has been much over-exposed, throw the solution away and pour on, as I said before, some pyro. and bromide, doubling or

trebling the quantity, if necessary, adding ammonia very cautiously.

Note this.—Pyro. intensifies, ammonia develops, bromide restrains, that is, keeps the shadows clear. Therefore an under-exposed plate requires more ammonia, an over-exposed plate more bromide. In the first case, the pyro. is lessened to give the ammonia more time to act; in the second place the pyro. is increased to get density before the ammonia has time to bring out too much detail. Too much density and too little detail, shows a want of exposure, and makes a hard or black and white picture. Too much detail showing over exposure, makes a flat picture.

If you study the foregoing remarks thoroughly, you will have mastered the principles of development, and be able to control it so as in most cases to produce good results.

A restrainer more powerful than bromide, which, however, should not be omitted, is citrate of soda or of ammonia. If you add to the developer, when the plate is evidently much over-exposed, a solution of this salt containing an amount equal to the amount of ammonia already in the developer, it seems to stop the action of the latter, and allows only intensification to proceed, but no development of detail. This is an immense advantage. Thus, take of the citrate 1 oz. and dissolve in 6 oz. of water, then you would have to add 3 drops or minims to every drop of the ammonia which has been added to the developer, then more pyro. and more ammonia and citrate may be added to intensify. If possible, don't wash off until the image is dense enough, whatever means are adopted to make it so. If this is not done, intensification will have to be resorted

to afterwards, which should always and by all means be avoided.

Another developer, which has lately been highly spoken of, is hydrokinone, a substance obtained from aniline and somewhat analogous to pyrogallic acid, but possessing no real advantages over it.

Of hydrokinone 1 grain to 1 ounce of water is generally sufficient, with ammonia as usual; or, if preferred, a few, say two drops of a saturated solution of common washing soda as an alkali may be substituted; but the image with soda comes up much slower, and if the plate be under-exposed, it may be hastened by the addition of ammonia.

No restrainer such as bromide of potassium, is usually required, and the solution is capable of developing many plates in succession so long as it is not discoloured.

Hydrokinone will also, when dissolved, keep for many weeks, when not mixed with alkali. At present, however, it is not largely in the market, and the price is also high as a chemical curiosity.

In developing photographs of interiors use the pyrogallic diluted with about 50 per cent. of water, generally treating them as under-exposed plates. In some few cases, where the plate is known to be much under-exposed it may be soaked for a minute or up to five minutes or more, according to circumstances, in a weak solution of ammonia alone, two drops to the ounce of water, after which wash under the tap. No apparent effect is produced, but the image will come up better when the ordinary developer is poured over.

A dodge I have found extremely useful while developing interiors or any views containing large dark patches, such

as spaces under overhanging trees, or portions of a building in heavy shadow, is to take a much stronger solution of ammonia than that used in the developer, say three or four times as strong, and with a brush dipped in this, paint over the undeveloped part, tilting the ordinary developer away from that portion for a few seconds, then rocking the dish again in order to prevent the formation of lines around the attacked part. This plan frequently brings up detail in the shadows that would inevitably be lost, except at the expense of the remainder of the picture. Ceilings of rooms and churches can thus be shewn which otherwise would be but a black mass, as the light is generally low.

Many may prefer to devolope by ferrous oxalate. This plan avoiding almost entirely the thoughtful watchfulness necessary in ammonia development. This process will be found in the chapter under heading "Magic Lantern Slides," but the operation may be continued further, in accordance with previous directions as the veiling of the plate—so detrimental to a transparency—is not of so consequence in a negative when density is of greater importance. A longer exposure is necessary in the first place. The iron not being so energetic as pyro. and ammonia.

Several good and reliable developers will be found amongst "Formulæ" at the end of the book.

CHAPTER VII.

FIXING THE NEGATIVE.

The negative being now developed, must be well washed, to free it from pyrogallic acid, which if left in would stain it;

three or four minutes are generally sufficient for this in running water, or with frequent changes of water for a longer time. Now, read again the printed directions enclosed with your dry plates and you may find it to be necessary to soak the plates in a strong solution of alum, to harden the film. If it tells you so, by no means omit to do it or you may lose your negative. Some qualities of gelatine films frill (or soften and expand) during the final fixing, and leave the plate altogether; to avoid this, alum is used to harden it and so prevent the evil. I have never found it necessary, in this country, though it may be so in very hot climates. Depend upon it, if the maker says so, it is not wise to dispense with this precaution. Again well wash and place the plate face upwards in the fixing bath, in a solution of 4 oz. of hyposulphite of soda in 1 pint (20 oz.) of water (a tea-cupful of hypo. is about 4 oz.). Leave it in this until all the [white portion of the plate as seen at the back] has disappeared, let it remain in for a minute or two longer; for if the whole of the undecomposed bromide of silver, which forms the unattacked portion of the plate, is not removed, you have another source of stains. To be fully certain of this, I employ two baths of hyposulphite, of equal strength, the first being used for successive batches until the second begins to discolour, then replace the first by the second and make a new one for the second. For the sake of economy I keep for this purpose the fixing bath from prints (which may not be used for them a second time) the plate is lifted out of the first bath, slightly rinsed in water, and placed in the second until another plate waits to take its place. The extra time can do no

harm, though a minute or two is generally sufficient. Now wash ; and here no stress is too great to lay upon the fact that, unless all the hyposulphite is thoroughly eliminated from the film, the negative will eventually be spoilt.

Wash well in running water as long as convenient ; then let the plate soak either upright or face downwards, for an hour or two with several changes of water.

Afterwards lay it in a clearing solution, composed of 1 oz. citric acid and 1 oz. of alum in 10 oz. ($\frac{1}{2}$ pint) of water ; this hardens the film and clears away any brown color left by the hypo. A couple of minutes suffices for this ; again wash, all night will do no harm, soaking, if the face be not left upwards, will do. If the surface of the gelatine be left upwards, of course, no change of water takes place and very little good done, whereas, if placed on edge, as in a grooved washing trough, made for the purpose, such as shown on page 17, chapter 3, the hyposulphite is dissolved out, falls to the bottom, being heavier, and fresh water acts continuously on the film.

Now drain and dry, without heat, by placing the negative on its edge, face outward, so that a current of air may pass over it, or if you want to dry quickly, it can be done by soaking the plate after draining for a minute or two in spirits of wine, the lighter spirits absorb the water, and there is now no danger in drying the whole before a fire or on a stove.

In all these operations avoid *fingering* the plate on the face. Grease spots prevent the action of liquids used and often produce marks which spoils the printing from the negative.

CHAPTER VIII.

FAILURES AND THEIR CAUSES.

You can now judge if the negative is good or not. If good, you will find a small portion only very dense, a bit of sky or a shirt front, a small portion also clear glass or nearly so, some deep shadow, such as an open window, a peep under the rocks, or in a figure the strongest shadows only. All the rest, whether figure or landscape, should be full of graduated details, neither predominating. The whole of the sky should not be too dense, a white sky is objectionable, so is an uneven or dirty one. There should be some detail in the darkest shadows (except perhaps the bit before mentioned); the heaviest trees or the blackest velvet should all have gradations of blackness. If this is not so, either the picture is under-exposed or over-developed. If it also be wanting in density, it is under-developed; if it is in parts very dense, it is under-exposed; if it be loaded in its detail, and is without density, it is over-exposed; if too dense all over, it is over-developed.

The plate is frequently more dense towards one end than the other. This is caused by the film of the dry plate being thicker at that end.

Transparent spots are sometimes found after developing. These show, if patchy, a defect in the gelatine, if like small pinholes, they arise from dust having settled on the surface of the film.

Round, half-developed spots with sharply defined edges show that air-bubbles have been allowed to accumulate and prevent the action of the developer. Use the brush better, or break the airbell as it forms.

The edges of the plate may be frilled, shown by the thinness in parts, and lines of density spreading towards the edge of the plate, this is caused by the gelatine being soft. Keep the plate longer in the alum bath before fixing.

There may be a spot much more dense than the rest of the plate. Most likely caused by pouring the developer on the plate in a stream on that one spot, instead of pouring it all round the edges quickly.

A patch of fog may appear in irregular shape on a portion of the picture, this arises from light being admitted into the camera, through some opening other than the lens itself, it may be a hole in the camera or in the bellows, or that the fronts don't fit tightly, or through the diaphragm slit, in the lens itself. Examine your camera well, find out, and remedy this, or keep it perfectly covered with the focus cloth during exposure of the plate.

Local fog or lines may be caused by the dark slides not being light-tight, look to this and always keep them covered while out of the bag or box in which they are carried.

If you use a change-box there may occur a line, or several, right across the width of the plate, caused by the plate being thick, refusing to pass freely from box to slide or back again. Don't put thick ones in.

Fog all over may arise from great over-exposure, or from a wrong light in the dark room, or from carelessness when putting the plates in the dark slide.

Sometimes the plate is entirely fogged at one end, arising from accidentally pulling the shutter out of the dark slide a portion of the distance unprotected, or even the whole slide with the shutter open may be pulled partly out of

the camera if the precaution in both cases is not taken to see the catch is made secure.

If the plate seems stained yellow or brown, you have probably not used the clearing solution (citric acid, &c.)

If by reflected light it shows a green or red colour, this is caused by excess of ammonia in the development, especially when used without a corresponding amount of bromide.

If very large opaque spaces appear with a white or grey appearance at the back of the plate, it has not been fixed enough.

If the plate, after drying, has a dull whitish crystalline appearance on the film, it has been insufficiently washed.

If you have gone carefully through this work and attended rigidly to the minutest of the instructions given, you ought not to have any failures, no details have been given without an object, and nothing said which could well have been omitted, therefore, if error has arisen, you will find that somewhere or other the directions have not been followed.

CHAPTER IX.

ON INTENSIFICATION.

Well, good or bad, you have your negative, and perhaps find there is room for improvement.

The one defect most likely to occur is that it is too thin, either from over-exposure or under developing, though I have urged all throughout to use every means to get it up to proper printing density in the first development.

Avoid intensification if you can, try a print first and see (when it is finished, not when first printed) whether it needs it, and if it must be so, proceed as follows :—Make a solution of perchloride of mercury, 100 grains to 10 oz. of water and allow the plate to soak in this until its surface bleaches to a pale grey color. Take out and wash well, back and front, for a few minutes and flood the plate with a weak solution of ammonia, 10 drops to the ounce of water, and again wash ; this will change the color to a deep brown or black, and on looking through will be found more brilliant; this will also test the cleanliness with which you have worked. If it is now stained or uneven, perhaps having a layer of yellow, or perhaps, in part not intensified at all, depend upon it you have not washed it sufficiently at some stage, most probably after fixing. The process may be repeated if necessary, and very great density obtained, but this is usually inadvisable.

If only a slight intensification is required, allow the plate to soak in the mercury solution only until the surface begins to turn grey. The final density depends upon the length of time the plate is left in the mercury bath.

If you find that you have made it too dense, it may be reduced by soaking in hypo-sulphite soda ; or in the mercury solution, without adding the subsequent ammonia. In cases of very great contrast, the latter is the best and the plate then prints quickly.

Another plan of intensification is to soak the plate in a 2 per cent solution of pyrogallic acid, return it to the cup and add a few drops of a mixture of 2 drams of acetic acid, 50 grains of citric acid, and 1 oz. water, add to this in the cup a few drops of solution 20 grains nitrate of silver to one

of water, and continuing to add this until the required density is obtained. There is no fear of this changing afterwards as in the case with mercury, but there is fear of staining the plate with a red fog, and the operation is altogether a dirty one, both as regards plate, apparatus and operator, unless great care be used.

Still another is a solution of 20 grains nitrate of uranium and 20 grains of ferricyanide of potassium in 5 oz. of water, more of the latter salt to be added if the required density be not attained.

A method suggested by Mr. Houlgrave, of Seaforth one of our most careful workers, is the following :—

- A 120 grains Iodide of Potassium.
 60 grains Iodine.
 3 ounces Water.
- B 2 ounces Alum.
 2 drams Hydrochloric Acid.
 1 dram of solution A.
 20 ounces of water.
- C 120 grains Sulphate of Iron.
 120 grains Citric Acid.
 2 drams Acetic Acid.
 1 ounce Alcohol.
 9 ounces Water.
- D 20 grains Nitrate of Silver.
 1 ounce Water.

Immerse in B solution for one minute, wash well and immerse in C for the same time, add a few drops of D to C and flow over from a cup on and off, holding the plate in the hand until density be obtained. These particulars must be rigidly followed or failure will result—simple immersion in the iron solution will not suffice.

Mr. Edwards suggests the following :—

A Alum, 1 ounce.

Citric Acid, 1 ounce.

Water, 20 ounces.

B Saturated solution of protosulphate of Iron.

When required for use, 4 parts of A are added to 1 of B.

This solution not only clears the negative but slightly intensifies. The addition of a few drops of a 20-grain solution of nitrate of silver increases the density at will. There is no danger of staining the film, providing the negative has, by perfect washing, been freed from hyposulphite.

If the original negative be very thin indeed, a process first used by myself and afterwards recommended by others will be found useful, as follows :—

After using the mercury solution as named first in this chapter intensify with silver as described, and an image, which was almost invisible by transmitted light, will be brought up to full printing density. The mercury seems to form a basis for the silver to build upon, and is very powerful thus.

A slight, but clean, intensification is obtained by first bleaching as usual by mercury, but substituting a saturated solution of sulphite of soda for ammonia. This is especially suited to lantern slides.

If the negative has been over-developed and found too dense, it may be reduced by a solution of per-chloride of iron, 50 grains to 5 oz. of water, and afterwards re-fixed in weak hypo-sulphite, and washed, or by immersing it in a solution of Holmes' Photo Ozone, 4 drams, chrome alum, 10 grains, in water about 6 oz. and re-fixing in the hypo. bath. Excessive local intensity may be reduced by

carefully dabbing on the Ozone with the point of the finger.

The negative may now be varnished by warming the plate and pouring over it that material, and when covered pouring back into the bottle the superfluous quantity, keeping the plate slightly moving till set, to avoid streaking in the direction of the flow, and dry before the fire ; be careful not to pour too much on, or it will run over the plate disagreeably.

If only a few prints are required, the varnishing may be dispensed with, and a thin coating of plain collodion flowed over the surface of the film, and allowed to dry cold, will sufficiently protect it.

CHAPTER X.

RE-TOUCHING AND PRINTING.

The negative is now complete, as far as chemical means can make it. If there are transparent spots, paint them out, if large, with a brush ; if very minute, with a pen and ink. Scratches, if any, should be painted out as near the density of the missing part as possible. Thin spots may be pencilled and re-touched generally by rubbing the imperfect part with the finger and a little ground resin, which sufficiently roughens it to allow of a bite for the pencil. Many harsh tones, especially heavy shadows in the face, may be softened down by the use of the pencil. Hardtmuth's or Faber's H. H.H and H.B. are the best. To do this the glass must be held up to the light of the sky

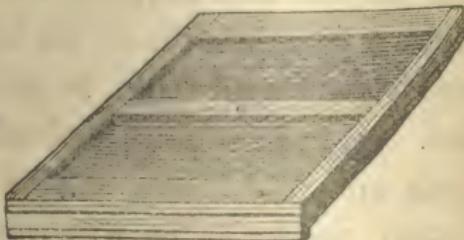
or a reflector. Retouching desks are made especially for this purpose and supplied with every requisite. Clouds also may be painted in on the back, or frequently strengthened when already thin, or put in with the pencil on the face. An indication of a cloud, or a small bright one to break up some heavy shadow, is frequently all that is wanted, unless it be to cover some defect in the sky. Moved figures may thus be sharpened ; and in the shadows under the trees, fowl, and their reflections, may be painted or pencilled on the water. Many little dodges like this may be easily and effectively managed and will suggest themselves to the operator, for there are very few pictures so fully supplied with life or so perfect that a little care will not benefit them.

There are several processes of printing on paper, each of which being distinctly different, we must consider them separately :—The carbon, the platinum, the bromide, and the chloride (or albumen paper) processes, of which the latter being the general one we will treat of first. The requisites will be :—2 or 3 printing frames, the proper size of your negatives, some albumen paper, which is bought in sheets ready sensitized with silver, a bone paper-knife, a good-sized porcelain dish for toning bath (which must be kept exclusively for this), another dish of the same size for fixing bath, some chloride of gold, or some gold solution ready prepared, hypo-sulphite of soda, a vignetting glass or two, some black paper masks, with cut centre openings, a glass guide for trimming the prints, a sharp knife, a slab of thick glass, for cutting on, and (what is not an absolute necessity, but most useful) an automatic tray or trough,

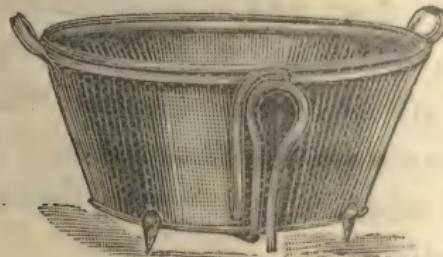
for finally washing the prints. The "Godstone Tray" is a good one, so is the one shown below.



Printing Frame.



Glass Slab.



Automatic Trough.

Now to commence operations, you must first cut up a sheet or two of the sensitive paper to the size you require. This must be done with the bone knife, and by gaslight or subdued daylight, and bearing in mind that the paper, when damp, will stretch a little in the mounting, either in length or breadth according to the way in which it is cut, the following instructions will be useful :—

For Cabinet size :— Fold the sheet lengthways in three equal parts, and cut each strip into 5, this gives you 15 pieces all stretching in length.

For Cartes :— Cut each of the above into half, this gives 30 pieces, stretching in width.

For half plates :— Cut a strip of 4 inches off the sheet lengthwise, and this into 3, then fold the remainder into half lengthwise, and cut each fold into 5, this gives 10 pieces stretching in length, and 3 in width.

For $\frac{1}{4}$ plates :—Cut each of the above into halves and you have 26 pieces ; 20 stretching in *width* and 6 in *length*.

For 5×4 negatives :—Cut a strip of $2\frac{1}{2}$ inches off the bottom of the sheet, this will make 5 cartes de visite (stretching lengthwise) then the remainder of the sheet cut into 16, all stretching in *width*.

For $7\frac{1}{2} \times 5$ size :—The sheet cut into 9 pieces, all stretching in width.

For larger sizes :—Take your negative and plan the mode of cutting without waste by measuring on the surface of the paper before folding.

Touch the sensitive side of the paper as little as possible with the fingers ; after cutting it is best kept in a book of blotting paper, tightly pressed so as to exclude air, or rolled up in an air-tight tin case, any way most convenient to protect it from the air and its deleterious contents.

Now take out the back of printing frame, by opening the springs, lay your negative in the frame with the film side upwards, put over it a piece of the sensitive paper, prepared side downwards, replace the back, fasten down the springs firmly, and place the frame on its edge towards a good light which will penetrate through the glass negative, and print on the paper pretty quickly. Thin delicate negatives print best in the shade, dense ones require a strong light, but avoid printing in direct sunlight ; the quicker your prints are obtained, the quicker and better they tone. You must examine the paper occasionally so as to judge how far the print is progressing, by loosing one spring, and lifting up on half of the printing frame back, and then replace it if not done enough.

The printing of the original pictures must always be prolonged until the whole is somewhat darker than you would like it to remain, as the subsequent toning and fixing brightens it considerably by eating away the lighter tones.

When you consider the print is dark enough, remove it from the frame, put it in a box or book away from the light, and begin afresh with another piece of paper, and so on until you have the number of prints you require, and they may all, if stored away from light, remain some days until you have sufficient to tone a dozen or two together, although *very* long keeping before toning is apt to injure the purity of the tones a little.

When printed, the pictures should be trimmed; that is, cut to the size they are intended to remain. It is more economical to do this before toning, as it saves gold; though many prefer to cut them after, as the result can be better judged. The trimming should always be done with a sharp knife and a glass shape, which for leading sizes may be bought, or with a strait-edge of steel; by this means you are sure to get your picture square and nice, a most important feature in the appearance when mounted. No picture can look well if not cut true.

If the sky is clear and white, clouds may be printed in (after the landscape and before toning) from a separate negative, which, if not at hand, may be bought; waxed paper negatives are good, useful, and cheap. During this operation the picture must be masked, either by a sheet of opaque paper cut out to the sky-line (a spoilt print answers the purpose best, having it already drawn on it), or a handkerchief or cloth roughly folded to the shape

The mask, however, must prevent the already printed picture from being again exposed, and also by movement prevent a harsh line from being formed where the shadow is cast. Constant movement of the cloth, carefully performed, does this well.

If you have a frame large enough, the print after being removed from the original negative may be thus exposed under the cloud negative. If your printing frames are only the size of the glass, make a temporary one, by a large piece of glass and a back board from an ordinary frame and hold the whole in your hand. A little experience is necessary to put clouds in well, but there is no difficulty about it.

Sometimes if the sky is very thin or dirty, it is better to paint the whole of it out in the negative, so as to get a perfectly white sky, and then print clouds in at will.

The toning solution is prepared as follows :—

1 grain Chloride of Gold.

30 grains Acetate of Soda.

8 ounces of Water.

Mix and keep for two days before using. The solution can be used over and over again, adding fresh gold solution after each toning. The gold, bought in tubes of 15 grains, is best dissolved in 15 drams af water, thus one dram is equivalent to one grain. It is usual for one whole sheet of paper to take up one grain of gold when used in large quantities, therefore, the amount of solution made is regulated by the number of pictures and their size, for small quantities you must use more gold in proportion. Having made your toning solution, and toned say as many pictures as are cut out of a half sheet of paper, then, before putting away add a dram of gold solution, which is as much as you

have extracted. It is then ready at once for the next batch of prints.

Many prefer to make a fresh lot of toning for each batch, and immediately before using, thus :—

1 grain of Gold.

4 grains Bicarbonate of Soda.

8 ounces of Water.

This may be used in two or three hours after mixing, or as soon as the yellow colour of the solution has changed to a pale green, or is almost colourless. It is inadvisable to use this a second time, except immediately after.

Take the prints and soak in clean water for a few minutes, then subsequently in two or three changes of water. The first wash water, being rich in silver, may be kept, and added to other residuum as afterwards mentioned.

Then immerse each print singly in the toning solution. Keep all moving, and separate each from time to time, to allow fresh gold to act on every portion freely. It will require from ten to thirty minutes, according to varying circumstances; the temperature influences the duration of time; a cold solution acts slower than a warm one; and, as previously stated, a slowly printed picture, or one which has been kept dry, tones slower. Each print must be left in until it assumes a purple or rich brown tint, and, when held up to the light, must show no red colour by transmitted light. When this is so they may be taken out and put in some plain water, into which a pinch of salt, quantity not important, has been dissolved. This prevents the action of the gold while waiting until the remainder are finished. These operations may be conducted

in a subdued day light, but a strong light will injure the brilliancy of the result.

When all are toned, they are fixed in a solution of hyposulphite of soda same strength as that used for the plates, viz., 4 oz. of hypo. to 20 oz. or 1 pint of water. Dissolve hot, but allow to go quite cold before using, and this must be made freshly for each batch of prints. They are left in this for ten minutes in summer, fifteen in winter, using the same precautions as mentioned above, to keep each separated, so that the hyposulphite may act freely. Then wash thoroughly in many changes of water or in running water, for twelve hours ; if you possess one of the washing troughs, which I previously named, attach by an india-rubber tube to a water tap, put in the prints, and let the water run all night, then in the morning take out, dry them between blotting paper until they are just limp, and they are ready for mounting.

The carbon process I will not explain here, as it is very little used by amateurs, except for lantern slides, and a full manual is sold by the Autotype Company, who supply the tissue.

A process which is now rapidly coming into favour, and well deserves its reputation, is the Platinotype. To use this a license costing 5s. is necessary, obtainable from the Platinotype Co., London, who give particulars and instructions. But (these buts always will come in) the negative must be specially clean, bright, and strong in its contrasts. One which will produce a fair print on silver paper may fail to give the best results in plantinum. Good black and white negatives do for plantinum, soft thin ones for silver.

Another application of this process is to textile fabrics, and the lady members of the family ought to be grateful for the introduction of this branch. As a sample of permanence, I have before me a very pretty picture, printed on satine, which has been washed, boiled, soda'd, scrubbed, and is now only brighter than before.

Great precaution must be taken to keep this paper in an air-tight case free from damp before development with oxalate.

The prints are rolled on rough paper, giving the appearance of a fine engraving or hand drawing

Good effects may be produced by the use of a black chalk pencil; lines deepened, trees and figures put in, &c. The image itself is, like the carbon print, absolutely permanent; this, in the case of good pictures, is an invaluable quality, though there are prints I will not call pictures, which are much improved by fading away altogether.

The paper may be had extra thick, and when expense is no object, views, &c., vignetted in the centre of a large sheet and then bound up, unmounted, make a volume which will be envied by all lovers of the beautiful.

The process is very simple: the paper is bought ready sensitised, exposed under the negative in the usual way, but only until the darkest shadows turn from brown to pale grey, while the lighter tones are still invisible.

The prints must, if possible the same day, be floated for an instant on a solution of 120 grains neutral oxalate of potash in 1 oz. water and heated 170° F. in an enamelled tray. The grey image changes at once to a deep black

and the lighter shades appear. Nothing remains but to soak it successively in two solutions of weak hydrochloric acid, wash then for ten minutes in cold water, and it is finished.

In the last edition of this Handbook I mentioned a new bromide of silver paper for printing by contact in artificial light, and developing out the picture. The advent of that paper was evidently premature for it did not bear out the promises of its birth, and therefore never found favour with any but experimentalists during the brief period of its existence. It was, however, the forerunner of something better which is now in the market commercially by more than one manufacturer; it can be had ready sensitised and cut up into usual sizes for use, and treated according to the instructions sent with it, yields points of an engraving black tone, and, as averred by the makers, of a permanent character. It is slightly higher in price, but it requires no toning with gold—and the process is so simple that I can only advise the reader to try it and judge for himself.

CHAPTER XI.

MOUNTING PHOTOGRAPHS.

Much taste can be displayed in this matter, both as to style, colour of mount, size of margin, &c. A pale cream, buff, or French grey tint will suit a vignetted picture, whilst darker tints such as maize, olive green, or even black may be used for photographs of a deeper general

tone,—a contrast between the tint of the mount and the photograph always sets off the latter to advantage, and therefore I consider a chocolate colour in the mounts most undesirable, though I know they are used,—however, *chacun a son gout*. The latest fashion is a real gold bevelled edge mount, which may be had in a variety of suitable tints, and very effective they are for all pictures of small size—such as Cartes, Cabinets, &c. I must, however, add a word of caution: avoid highly glazed, or enamelled surfaces, and beyond all avoid any *gold* printing, or marginal lines upon the mount, these being produced with gold bronze (not gold leaf) will rub on the face of the photograph a powdery metallic substance, which will surely spot and fade the photograph in a very short time.

The easiest mountant is starch, and the best is the Glenfield. A special past is made for sale, but has no superiority for ordinary work. If the print is much cockled or crushed, it had better be re-soaked in clean water, and partially dried between sheets of blotting paper until limp.

Always mount your prints in this state, as they dry much flatter by gently rubbing down with the hand, or a squeegee, and letting them dry spontaneously, after which, to complete your picture, spot out with a brush and Indian ink, or sepia, any slight defects; this will frequently be necessary if the negative was originally defective.

If a higher gloss is preferred on either the mounted or unmounted prints, they are usually passed through a

hot rolling-press, or a burnisher; the ordinary kind costing about 30s. for a cabinet size, requires to be heated, and upon the right temperature depends to a great extent the finish of the surface given.

A burnisher is undoubtedly a disideratum, though not a necessity, it requires to be carefully used.

There is also a very pretty form of mounting photographs to hang on the wall, or stand on the mantel-piece, it consists of a plain gilt metal rim, fitted with glass and back, and is usually in an oval form. Having procured some of these, the mode of mounting the photograph in close contact with the inner side of the glass, is as follows:—The print when perfectly dry is flattened out with a moderately warm iron, then trimmed to the shape, and a little less than the size of glass, which must be carefully washed then kept in a dish of water at a temperature of about 100°, then prepare a solution of gelatine (1 part to about 12 parts of water) place this in another dish and keep at the same temperature, in which immerse the prints as you trim them. Take a piece of strong level glass of good size, with a thick piece of paper pasted down upon it to form a table or bed, an india rubber squeegee, and a clean cloth. Now to mount the print, take a glass from the hot water dish, just draining off superfluous water, lay it on the glass bed, take a print from the gelatine solution, lay it face downwards on the oval glass, press gently down to its proper position, drain off any excess of gelatine, and smooth down into close contact by the squeegee, then set aside to dry, after which frame it in the metal rim, insert the back, bind the back

edge of it with a strip of adhesive paper to exclude the air, and it is then finished.

CHAPTER XII.

MAGIC LANTERN SLIDES, OPALTYPES, &c.

One of the pleasantest branches of Photography is its uses in the production of lantern slides, more especially since gelatine plates are now prepared in such perfection for this purpose that with care, transparencies of good quality may be produced.

I dare say that many of my readers possess one of those modern instruments, a sciopticon, or optical lantern, and if so, they will not only find it useful in producing the enlarged photographs referred to in another chapter, but also as a winter evening's amusement, for exhibiting enlarged views of mountain, sea, or land, which have been photographed during the summer's rambles; or for the family portraits, groups, and other domestic pictures which have been obtained by the camera, and which are sure to form a large number in an amateur's stock of negatives. These being reproduced in the form of lantern slides by a very simple process of contact printing and development, are always interesting to your friends—when they can see them depicted upon the screen "as large as life, and quite as natural;" the process I will explain as concisely as possible in this chapter.

Firstly, you must procure some of the sensitive plates, $3\frac{1}{4}$ in. by $3\frac{1}{4}$ in., or you can make the proper size by cutting 1 inch off the usual quarter-plate, but it is advisable to obtain the correct plate from the manufacturer, because they are made from a specially prepared emulsion, and upon a suitably thin glass, so that when finished, the lantern slide will not look thick and clumsy. Having procured these, you must now select one of your printing frames with a pretty deep rebate, and place your negative in the usual way within it, *i. e.*, with the film side upward; take it into the dark room, and under ruby light place one of your lantern plates, prepared side downward, upon the exact part of the negative which you wish to re-produce as a picture, first taking care that you have removed any speck of dust from the negative and the plate, by brushing their faces lightly over with a soft camel's hair brush or a silk handkerchief, before placing the two plates in contact, then insert the back of the printing frame and press it closely down with the springs, so that perfect contact is insured. This is, if anything, more important than printing upon paper, because the latter is of a yielding nature, whilst your glass lantern-slide is not. Now expose the face of the printing frame, so as to print through the negative, to the light of an ordinary gas flame or a paraffin lamp, by holding it in the hand, about 12 or 14 inches away from the light, so that the whole surface of the plate is equally illuminated for 4 or 6 seconds only. You now return to the dark room, and taking the sensitive plate out of the frame, place it in a shallow tray of ebonite or porcelain, face upwards, for developing, which must be done by the

Ferrous Oxalate method, and the tray must be used for this purpose only.

The best formula I have met with for developing these transparencies is one issued with the plates obtainable from the makers, it is as follows :—

Mix in two separate bottles.

IRON SOLUTION.

Protosulphate of Iron, Pure, 4 drams.
Hot Water, 4 ounces.

Dissolve and use cold.

OXALATE SOLUTION.

Neutral Oxalate of Potash, 2 ounces.
Bromide of Potassium, 5 grains.
Hot Water, 8 ounces.

Dissolve and use cold.

For making the developer, take one part of the iron solution and two parts of the oxalate solution, mixed together in a glass measure in sufficient quantity to well cover the plate, pour it deftly over the surface of the plate in one wave, and then by a continuous rocking movement of the tray in the hand, keep the solution flowing backward and forward on the surface until development is completed. You will find a faint image very soon appear the strongly-lighted portions coming out later, and the picture will very gradually increase in strength; continue developing so long as detail is apparent in the deepest shades, and just so long as the high lights remain perfectly white; but should they show a tendency to veil over or discolour, then pour off the solution, rince the plate in cold water and place it in the fixing bath freshly made (hyposulphite of soda 4 oz. and 1 pint of water) to clear and finish at once. Let the plate remain in this fixing bath until perfectly

brilliant, then wash it thoroughly in cold water for some time and set upon its edge to dry, the same as you would a negative.

If you should now find the transparency very thin, and wanting in due contrasts of light and shade, it shows over-exposure to light ; if, on the other hand, it is wanting in clear details in the deeper shades, it shows under-exposure. The remedy in either case is obvious ; supposing that your picture is perfect, *i.e.* bright, clear glass in the high lights, full of delicate detail in all other parts, and with plenty of contrast, you may then, after it is dry, look it carefully over, and touch any little imperfections upon the film with a lead pencil, then coat over the surface with a very pale, thin varnish. Take a piece of perfectly thin glass, the same size as your plate, viz., $3\frac{1}{4}$ by $3\frac{1}{4}$, and put over its face, placing between the glasses a thin black paper mask, with a cut aperture, 3 in. circle in the centre, bind all the edges of the two plates closely together with strips of gummed paper and your slide is complete.

You should always recollect that when exhibiting your picture in the lantern, and it is enlarged 4 to 6 feet in diameter upon the screen, it will show every small imperfection in the slide, therefore it should be produced microscopically sharp, and with fullest amount of vigour obtainable in development, as it cannot well be improved afterwards.

The opaltype is another and very beautiful form of permanent photograph suitable for framing as a picture, or as a transparency for hanging in the window so that the light is transmitted through it, or for the ornamentation of hall lamps, and many similar purposes ; it is produced by

direct contact printing from the negative, or by enlargement in the camera to any required size.

The directions given in this chapter for producing Lantern Slides apply equally to opalotypes, but even greater care is necessary that you do not expose too long to the light, otherwise you would be very much restricted in the latitude allowable for fully working out the picture during a long development, when the whites and half-tones would probably be degraded before the deeper tones were fully developed, the same formula for developing solution is used (protoxalate of iron) and you must exercise judgment in its continuance until the required strength or force in the picture is obtained, and so long as the highest lights in the subject remain perfectly white, but the moment that a tendency is shewn in these portions to veil over, the development must be stopped, the plate rinsed in water, and fixed in the hyposulphite bath, where it may remain a considerable time after clearing; the resulting picture should be soft yet vigorous, and it may be improved in brilliancy if soaked for some time in a solution of citric acid and alum equal parts, say 1 oz. of each in 10 oz. of water.

These opalotypes if printed by contact to the same size as the original negative will rarely require any touching up or artistic work upon them, but they may be coated at once with a pale transparent varnish, and are then ready for framing.

Of course the whole operation must be performed in a darkened room. The sensitive opal plates and special lantern plates are articles to be obtained from any dry plate manufacturer.

CHAPTER XIII.

INSTANTANEOUS PHOTOGRAPHS.

A few remarks on instantaneous shutters may not be out of place.

A so-called instantaneous picture may be taken in half a second. There have been times when I have failed to get sharpness in $\frac{1}{60}$ th of a second. So much depends upon the conditions, upon the movement of the object and your own, that it is difficult to give any reliable data to go upon.

Shutters are made in various ways, in front of the plate, behind the lens, inside the lens mounts, outside the lens, and outside and independent of camera and lens.

In theory, the best is between the lenses if a compound one, or behind the lens if a single one. The aperture between the lenses is smaller than that outside, and therefore the shutter may be made less cumbersome, besides, with this form of shutter all the rays of light collected by the lens are utilized in producing the picture, which is not the case when a shutter is used on the front of the lens; this is an important consideration. In principle, Kirkby's shutter (designed by one of our Liverpool amateurs and described in the *Journal Almanac* for 1881) is one of the best, it opens at once fully from the centre, and remains open for a much longer period than it takes in opening; whereas, most others directly they are open, begin to close again, allowing the full work of the lens only for a small fraction of the time the plate is exposed. The rotating shutter occupies little space, and is least likely to jar the camera during exposure.

For simplicity, the drop shutter is the best, and easily made. It consists solely of a long piece of brass, a hole in the centre and sufficient metal at each end to act as a cap. It opens and closes by liberating a spring catch. The open space in centre should not be less than the diameter of the lens. Mine is double, so that in effect I get a somewhat similar advantage to that noticed in Kirkby's, that it remains open even when falling; it works between the lenses and is therefore even for a large lens not more than 8 inches long, *i.e.* 4 inches of opening and 2 inches of solid metal. This is similar to the one known as the Liverpool shutter, which is made to act either between or at back of the lenses. As regards lens, etc., to be used in connection with this class of work, half a second is the longest you can expect to give, and get good results; therefore the rapidity of the plate and the light must determine what lens to use. The rapid rectilinear works in sunshine in $\frac{1}{24}$ th of a second, so that you can use a quick shutter with this, or stop down the lens and use a slow one. The ordinary symmetrical will answer very well for some subjects working in a good light but not in shadow.

B. There are several cameras made purposely, and called detective—a misnomer; to be detective, the appearance of a camera must be hidden from the public. Mr. Bolas was the first to introduce this in a box form; I have made one working inside a courier bag. Inside is a dial, the finger pointing to the number of yards from the object which distance must be judged by the eye. To expose I simply for an instant lift up the flap of the bag, at the same time releasing the shutter, a spiral one, then walk off and change the plate unobserved. But all pictures taken this

way are but hints, valuable perhaps to artists, but of little value of themselves unless sharp enough to enlarge, which, owing to the large aperture necessary to employ, is frequently not the case.

CHAPTER XIV.

ON ENLARGING AND REDUCING.

The only negative worth enlarging as a rule is one full of detail and soft, that is full of gradations without the high lights being too intense.

From such a one you may either take an enlarged transparency direct, or a small transparency, and then enlarge to a negative.

In either case attend to the instructions given for lantern slides as regards development, &c.

The small positive, as it is sometimes called, may be taken by the camera, or by contact with the negative in the printing frame. In the first case you may use daylight, in the second artificial light is best, as being more under control. If the negative is not a large one, I prefer to copy in the camera to a lantern size, as it may then be utilised for that purpose afterwards. To enlarge from this, if you have no other means, it is possible to do it in an ordinary lantern, focussing on a sheet of paper and then substituting the dry plate. The proper way is to have an enlarging camera, which a handy man may make, leaving out the bellows if too troublesome, and using any other means he may think best for obstructing extraneous light. The camera is simply an enormous copy of the usual

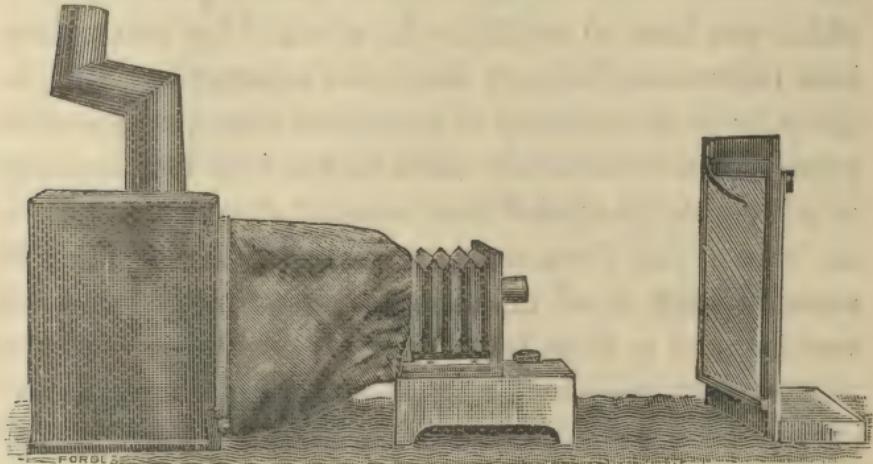
apparatus with a dark slide big enough to hold the largest plate likely to be used, and carriers for smaller plates. It is generally fixed on a long plank for base board, and on the same board in front of lens a movable framework to hold the negative. If the camera extends to say 5 ft., the size of the resulting picture depends entirely on the angle of the lens, the shorter focus and therefore wider angle naturally giving the larger result.

The exposure depends so much upon circumstances, that it is impossible to give any rule, but you can generally calculate roughly for a trial picture with a small plate; thus, if the camera is drawn out to 4 feet. and a lens with a $\frac{1}{2}$ inch stop used, you divide the 4 feet by $\frac{1}{2}$ inch and get 96, so that by adopting the plan I have before given in calculating exposures, you have one data to go upon. The question of light is entirely dependent on its source naturally; if you point it to the sky, the exposure may only be 3 or 4 seconds, according to the density of the negative; if to a reflection, more; if to a ground glass window, still more; if to an artificial light, very considerably more, and so *jon.* The development is as usual. Always experiment with a smaller plate first.

To reduce negatives, the same plan is adopted as above, only that the ordinary camera is used; in each case care must be taken to have the original negative *equally* lighted, by placing ground glass or tissue paper at some distance behind.

If you wish to produce a direct enlargement upon bromide paper, or opal glass, without first making a transparency, it is easily done by printing directly through the negative

with one of the simple Lanterns of this form :



The source of light is here a duplex paraffin lamp, the front of lantern is fitted with a carrier frame in which you insert the negative, with a piece of tissue paper behind it to diffuse the light, then attach your own camera and lens to the flexible bellows at front of lantern : focus the subject carefully upon a piece of white paper attached by drawing pins upon the wood stand placed at a sufficient distance away to give the dimensions of picture you require ; cap the lens, remove the piece of white paper from the stand, replace it with the piece of bromide paper (or opal), then make the exposure. The time requisite for this depends upon the character of the negative and also of the sensitive paper you are using ; full directions are usually given by each maker, as also for the after developing, which is always by the Ferrous Oxalate process.

CHAPTER XV.

RECOVERY OF SILVER, &c.

In the practice of photography, amateur or professional, it would be strange if there were no waste materials arising

from failures in working, or other causes probably over which you have no control :—i.e. a box of dry plates may have become useless from accidental exposure to light, to damp, or to the curiosity of inquisitive eyes, your sensitive paper may become totally unfit for use from long keeping, or prints may be spoiled from want of attention and care, but beyond this there must necessarily be an amount of waste product, small or great, from the most successful working, and as these waste products contain some of the precious metals—silver and gold,—it is worth while knowing how to recover them, or rather *the silver* (for the gold is not worth attempting) if only for the sake of experiment. All undeveloped dry plates contain bromide of silver in the films ; all untoned sensitive paper contains chloride of silver in the albumen ; all hypo bath used for fixing plates or prints, will contain some silver, as also does the first water used for rinsing the prints before toning : these are worth keeping, and silver may be recovered from them by either of the following methods :—

Throw all such solutions or gelatine films into a large jar or tub containing at the bottom some metallic zinc. The silver is after a time deposited on the zinc, when the superfluous liquid may be poured off to make room for another lot containing more silver, or

From the waste solution of hypo :—the silver may be precipitated by sulphide of ammonium or of potassium, as a black sulphide of silver ; but the odour is not that of roses, and may be objected to by some. The wash water from the prints may be treated with a little common salt, when the silver is thrown down as chloride.

To these precipitates add also the bnrnt cuttings from untoned prints (when fixed they are not worth saving).

By whichever means the silver is saved it is best kept until a large quantity is obtained, when any refiner will reduce it to the metallic state or purchase the whole. If only a few plates, and those small ones, are occasionally used it is not worth the trouble to try and economise in this way ; far rather use the extra labour on the plates themselves. The saving will be much greater.

You will find after the next two pages of Formulae there are some pages of blank paper left, on which to make memoranda of anything that strikes you as important. Such memos. are very frequently of great value for future reference, and will bear conning at times of difficulty. Addresses, &c. may also be noted down, or pages of books or journals, where some new or important information may be obtained.

One more piece of advice—take the *Journal* or the *News*, or some photographic periodical, and if near enougL to one, join a Photographic Association, and give your improvements to the world as freely as you find others have done. It is through amateurs the world has always benefitted. Don't be content with the information given in this short Handbook, it is only intended as a first stepping stone towards learning the beautiful art science of photography, and I need scarcely add, that it has been written with the sole view to *instruction*, and not for the purpose of recommending or selling the goods of any manufacturer, the very mention of which I have studiously avoided, where possible.

CHAPTER XVI.

FORMULÆ.

A few of the newest and most approved formulæ, are here given for developers, toning solutions, &c.

ALKALINE PYRO DEVELOPER.

No. 1 Solution—

Pyrogallic Acid	... 64 grains
Pure Citric Acid	... 6 "
Cold Water	... ... 4 oz.

No. 2 Solution—

Liquor Ammonia, 880°	1 dram
Potassium Bromide	30 grains
Soda Sulphite Recryst	2 drams
Cold Water	... ... 4 oz.

For use, mix 1 dram of each Solution in about 1½ oz. of cold water.

ANOTHER IN 2 SOLUTIONS.

No. 1—Pyrogallic Acid	1 dram
Alcohol (pure) ...	6 "
Glycerine (pure) ...	1 "

No. 2—Potassium Bromide	10 grs
Liq. Ammonia, 880°	1 dram
Glycerine (pure) ...	1 "

Cold Water 6 "

For use, dilute each Solution 1 part to 15 parts of water, and then mix equal quantities of each.

ANOTHER IN 3 SOLUTIONS.

No. 1—Pyrogallic Acid	1 oz.
Citric Acid (pure) ...	40 grains
Cold Water ...	6 oz.

No. 2—Liq. Ammonia, 880°	1 oz.
Cold Water ...	1 oz.

No. 3—Potassium Bromide	2 drams
Cold Water ...	1 oz.

For use, add 12 minims of No. 1 to 2 minims of No. 2, and 1 minim of No. 3 to about 2 oz. of Cold Water, as a normal developer, and afterwards add a little more of either Solution as may be necessary.

FERROUS OXALATE DEVELOPER

Iron Solution—

Protosulphate Iron	... 4 drams
Warm Water	... ... 4 oz.

Oxalate Solution—

Potash Oxalate (neutral)	2 oz.
Potassium Bromide	... 5 grains
Warm Water	... ... 8 oz.
When cold, mix 1 part of Iron to 2 parts of Oxalate Solution immediately before using.	

BEACH'S POTASH DEVELOPER.

Pyro Solution—

Soda Sulphite recryst	4 oz.
Hot Water	... ... 6 oz.

When cold, add—

Acid Sulphurous	... 3½ oz.
Pyrogallic Acid	... 1 oz.
Cold Water to make up	10 oz.

Potash Solution—

(a) Soda Sulphite recryst	2 oz
Hot Water	... ... 4 oz.
(b) Potash Carbonate	3 oz.
Hot Water	... ... 5 oz.
Mix these two together, and Cold Water to make up	10 oz.

For use, mix 20 drops of Pyro, and 30 drops of Potash Solution with about 1 oz. Cold Water.

HYDROKINONE DEVELOPER.

Hydrokinone (pure) ...	1 grain
Cold Water	... ... 1 oz.
For use, add 2 drops of Liquid Ammonia 880°, or 2 drops Saturated Solution of Common Soda	

CLEARING SOLUTION.

Citric Acid (pure) ... 1 oz.
Powder Alum (pure) 1 "
Cold Water ... 10 "

INTENSIFYING.

(a) Perchloride Mercury 80 grains
Hot Water ... 4 oz.
(b) Liquor Ammonia 880° 2 drams
Cold Water ... 4 oz.

First immerse the Negative in Solution *a* (when cold) until it is bleached, rinse well in Water, then immerse in Solution *b* until properly dense, after which wash copiously.

Solution *(a)*—Label "POISON."

ANOTHER INTENSIFIER.

(a) Citric Acid (pure) ... 4 drams
Alum Powder ... 4 "
Cold Water ... 10 oz.
(b) Iron Protosulphate 1 "
Warm Water (to saturation) 4 oz.
(c) Nitrate of Silver ... 20 grains
Cold Water ... 1 oz.

For use, add 4 parts of Solution *a* to 1 part of *b*, and add a few drops of *c* when required.

REDUCING.

Iron Perchloride ... 40 grains
Cold Water ... 4 oz.

OR ANOTHER.

Acid Hydrochloric (pure) 10 drops
Cold water ... 1 oz.

FIXING SOLUTION FOR NEGATIVES
OR PRINTS.

Soda Hyposulphite ... 4 oz.
Cold Water ... 20 "
This must be freshly made for prints after toning.

TONING BATHS.

Gold Solution—
Chloride of Gold ... 15 grains
Cold Water ... 2 oz.
Acetate Bath—
Soda Acetate (pure) ... 30 grains
Gold Solution ... 1 dram
Cold Water ... 8 oz.
Borax Bath—
Soda Boracis ... 40 grains
Gold Solution ... 1 dram
Cold Water ... 8 oz.
Carbonate Bath—
Soda Bicarbonate ... 5 grains
Gold Solution ... 1 dram
Cold Water ... 8 oz.
Phosphate Bath—
Soda Phosphate ... 20 grains
Gold Solution ... 1 dram
Cold Water ... 8 oz.

CONCENTRATED GOLD BATH,

Which will keep well.

Chloride of Gold (Johnson's best) ... 15 grains
Soda Acetate (pure) ... 90 "
Soda Bicarbonate ... 5 "
Cold Water ... 4 oz.

This contains about $\frac{1}{2}$ grain of Gold in each dram of the Solution, and must be diluted for use in proportion of 1 oz. to 8 oz. of Water. It should be made 24 hours before using. After each toning add a little more of the Concentrated Solution to the Bath about ten minutes before use.

MEMORANDA

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COMPLETE OUTFITS FOR AMATEUR PHOTOGRAPHY.

Including all Apparatus and Requisites for producing perfect negatives, and a set of materials for printing photographs.

THE AMATEUR'S—for $4\frac{1}{4} \times 3\frac{1}{4}$, Carte-de-Visite size ..	£2 2 0
THE STUDENT'S—, $6\frac{1}{2} \times 4\frac{3}{4}$, Cabinet size ...	£4 0 0

These are really good and useful sets, specially designed for beginners, being simple, easy to work, and producing good pictures of the usual sizes.

THE ARTIST'S :— for $4\frac{1}{2} \times 3\frac{1}{4}$ Carte-de-Visite size ..	£6 0 0
THE TOURISTS :— „ $6\frac{1}{2} \times 4\frac{3}{4}$ Cabinet size ..	£8 10 0
THE LIVERPOOL :— „ $8\frac{1}{2} \times 6\frac{1}{2}$ The Grand size ..	£12 0 0

Our popular and superior outfits for the more advanced Amateur. They include a long and short focus Camera, with two double dark slides, rectilinear Lens, folding stand, and all requisites for taking landscapes, architecture, portraits, groups, &c., and we recommend them as the most satisfactory apparatus possible, at a moderate price.

THE CYCLIST'S :— for Negatives $6\frac{1}{2} \times 4\frac{3}{4}$ and under ...	£13 0 0
THE OFFICER'S :— „ $7\frac{1}{2} \times 5$ „ „ ..	£14 10 0
THE GRAND :— „ $8\frac{1}{2} \times 6\frac{1}{2}$ „ „ ..	£18 0 0

These are the finest and most perfect outfits which can be had at any price, and when brass bound the apparatus is adapted for use in India or any climate.

They include one of our Special Cameras "The Semicycle," with all the latest improvements (as described on next page), three dark slides for six dry plates, extending leg tripod stand, instantaneous rectilinear lens, fitted with our newest drop shutter and diaphragms, focus cloth, non-actinic lamp, developing dishes, chemical solutions, measure glass, storing box, one dozen Liverpool Dry Plates, book of instructions, and leather case with patent lock, for camera, lens, &c.

(These 3 sets are quoted without the materials for printing.)

Brass Binding Camera and 3 Slides ..	25/-, 27/6, & 30/- extra
Waterproof Canvas Case for Camera ..	8/-, 12/-, & 17/6 extra
Leather Case (Patent Lock) ..	12/6, 15/-, & 21/- extra
Canvas Case for the Tripod Stand ..	6/-, 7/6, & 10/- extra

OUTFITS FOR PRINTING AND MOUNTING PHOTOGRAPHS.

$4\frac{1}{4} \times 3\frac{1}{2}$ 7/6 5×4 11/- $6\frac{1}{2} \times 4\frac{3}{4}$ 15/- $7\frac{1}{2} \times 5$ 17/6 $8\frac{1}{2} \times 6\frac{1}{2}$ 25/-

D. H. CUSSONS & CO., Manufacturers, 79, Bold Street, LIVERPOOL.

THE TOURIST'S FOLDING CAMERA.

(See Page 6.)

Polished mahogany, and long extension leather bellows body, rack focus, swing back, rising front, folding base, hinged focussing screen, and reversing back for inserting the dark slide horizontally or vertically. Light, rigid, and closing into a very small compass.

With 2 Double Dark Slides.	Brass Bound.	Extra Slides.	Brass Bound.
4½ × 3½ .. £3 10 0 ..	15/- extra	10/- each	3/6 extra
6½ × 4½ .. £4 15 0 ..	20/- ..	15/- ..	3/6 ..
7½ × 5 .. £6 0 0 ..	22/6 ..	18/- ..	4/- ..
8½ × 6½ .. £6 10 0 ..	25/- ..	20/- ..	4/6 ..
10 × 8 .. £7 10 0 ..	30/- ..	27/- ..	5/- ..
12 × 10 .. £8 0 0 ..	35/- ..	32/- ..	5/- ..

OUR NEW CAMERA "THE SEMICYCLE."

(See Page 8.)

Highly finished mahogany, and long expansion morocco bellows body, adaptable for long or short focus lenses, rackwork focus on folding base-board, swinging and rising front, swinging and rotating back, for reversing the dark slide horizontally or vertically in a moment without removal, or any detachable parts. A most perfect instrument.

Awarded Prize Medal at Liverpool Exhibition, 1886.

With 3 Double Dark Slides.	Brass Bound.	Focal Range.	Extra Slides.	Brass Bound.
5 × 4 .. £6 0 0 ..	20/- ..	3 in. to 12 in. ..	15/- ..	3/6 ..
6½ × 4½ .. £7 0 0 ..	25/- ..	3½ in. to 16 in. ..	17/6 ..	3/6 ..
7½ × 5 .. £8 0 0 ..	27/6 ..	3½ in. to 18 in. ..	20/- ..	4/- ..
8½ × 6½ .. £9 0 0 ..	30/- ..	3½ in. to 21 in. ..	22/6 ..	4/6 ..
10 × 8 .. £11 10 0 ..	35/- ..	4 in. to 25 in. ..	30/- ..	5/- ..
12 × 10 .. £13 10 0 ..	40/- ..	4 ih. to 30 in. ..	35/- ..	5/- ..

Cameras for Studio or Field.

" " Enlarging.

" " India or hot climates.

Camera Stands, Folding Tripod, with brass triangle, portable and rigid, 10/6, 15/-, 20/-, and 25/-.

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LIVERPOOL.

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(SILVER BROMIDE.)

Extra Rapid

Sensitometer No. 16.

BLACK AND GREEN LABEL.

For Landscapes,
and General
Out-Door Work.

The only genuine bear this



Instantaneous

Sensitometer No. 24.

BLACK AND WHITE LABEL.

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Drop Shutter,
Pictures, &c.

Trade Mark upon each package

They are most carefully prepared on specially selected glass, and every plate is so faultless that it will yield a perfect negative, without frill, blister, or fog, in any climate, if developed by the printed instructions.

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REDUCED PRICES FOR 1887.

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	Ex. Rapid.	Instants.			Ex. Rapid.	Instants.	
4½ × 3½	1/-	1/6		8 × 5 ..	3/9 ..	5/6 ..	
5 × 4	1/8	2/6		8½ × 6½ ..	4/3 ..	6/6 ..	
6½ × 3½	2/-	3/-		9 × 7 ..	5/- ..	7/6 ..	
6½ × 4½	2/2	3/3		10 × 8 ..	7/6 ..	10/- ..	
6½ × 4½	2/3	3/6		11 × 9 ..	9/- ..	13/- ..	
7½ × 4½	3/-	4/6		12 × 10 ..	10/6 ..	16/- ..	
7½ × 5	3/6	5/-		15 × 12 ..	18/- ..	24/- ..	

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(Silver Bromide). Pink Label.

In boxes of half-a-dozen Plates, with full instructions.

SIZE—4½ × 3½	5 × 4	6½ × 4½	8½ × 6½	10 × 8	12 × 10
PRICE—1/8	2/6	3/6	6/-	9/-	14/-

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(Liverpool Exhibition Prize Medal, 1886.)

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Working with great rapidity, and focal depth to an angle of 60°, giving true perspective, parallel lines, and brilliant definition from centre to margin of the plate. For landscapes, groups, architecture, instantaneous views, &c.

FOR PLATES—	5×4	6½×4¾	8½×6½	10×8
NETT PRICE—	£1 10 0	£2 10 0	£3 10 0	£5 0 0

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Working to an angle of 85°, with correct perspective, parallel lines, &c. For interiors, architecture in confined spaces, copying or enlarging.

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This is a well-known French Lens. Rapid, aplanatic, and giving good definition. For landscapes, architecture, groups, and general out-door work.

FOR PLATES—	5×4	6½×4¾	8½×6½	10×8
NETT PRICE—	£1 5 0	£1 15 0	£3 0 0	£4 10 0

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(With Waterhouse Diaphragms).

Their chemical and visual foci are coincident, they work with extreme rapidity, cover the plate perfectly, and possess great focal depth for portraiture.

	Diameter.	Focus.	For Plates	Nett Price.
1 B. ...	2½in.	5in. ..	4½×3½ ..	£3 0 0
2 B. ..	2½in.	6½in. ...	5 × 4 ..	£4 0 0
3 B. ..	3½in.	9in. ..	6½×4¾ ..	£6 0 0

Single Landscape Lenses:—7/6, 10/6 and 15/- each.

THE LIVERPOOL INSTANTANEOUS SHUTTER.

Adaptable to any lens, with a rigid mount, a simple drop action liberated by a spring catch, rendering perfect exposure from centre to margin of the plate.

For Lens under diameter of	.. 1in.	1½in.	2in.	3in.	
Price, fitted in the centre	.. 10/-	12/6	15/-	17/6	21/-
" fitted at the back	.. 20/-	22/6	25/-	30/-	35/-

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ANCHOR POTTERY,
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Beg to inform Amateur Photographers that
they have instituted a PHOTOGRAPHIC STUDIO,
at their Works, and are prepared to

Photograph on China, Portraits, Views, &c.

From Negatives taken by Amateurs.

Being burnt in the China, these Photos do
not change at all under the action of the light;
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IMPROVED.

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„ 3A „	$8\frac{1}{2} \times 6\frac{1}{2}$.. 26 15 0
„ 4 „	10 x 8 ..	38 0 0
„ 5 „	18 x 16 ..	42 10 0
„ 6 „	22 x 18 ..	54 0 0

RAPID "CABINET."

No. 1 for Cabinets, 14ft. distance	13 0 0
„ 2 „	18ft. .. 17 10 0
„ 3 „	20ft. .. 19 10 0

EXTRA RAPID C.D.V.

Invaluable for Photography Children.
No. 2A, 4½ in. focus, dia. 2½ in. .. 13 10 0
„ 3A, 6 in. „ dia. 3½ in. ... 25 0 0

QUICK-ACTING C.D.V.

No. 1 for Cards, 14ft. distance	.. 5 15 0
„ 2 „	16ft. „ .. 6 10 0
„ 3 „	19ft. „ .. 11 10 0

UNIVERSAL.

For Portraits, Groups, &c.

No.	View Size.	Group Size.	Back Focus.	Price.
1 ..	$8\frac{1}{2} \times 6\frac{1}{2}$	$7\frac{1}{2} \times 4\frac{1}{2}$	8½ in. ..	7 10 0
2 ..	10x8 ..	$8\frac{1}{2} \times 6\frac{1}{2}$	10½ in. ..	9 0 0
3 ..	12x10 ..	10x8 ..	13½ in. ..	12 10 0
4 ..	15x12 ..	12x10 ..	16½ in. ..	16 10 0
5 ..	18x16 ..	15x12 ..	20 in. ..	25 0 0
6 ..	22x18 ..	18x16 ..	24 in. ..	45 0 0
7 ..	25x21 ..	22x18 ..	30 in. ..	55 0 0

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„ 2	4 x 3	5 x 4	$7\frac{1}{4} \times 4\frac{1}{2}$	4in. 3 5
„ 3	5 x 4	$7\frac{1}{4} \times 4\frac{1}{2}$	8 x 5	5in. 3 10
„ 4	$7\frac{1}{4} \times 4\frac{1}{2}$	8 x 5	$8\frac{1}{2} \times 6\frac{1}{2}$	6in. 4 0
„ 5	8 x 5	$8\frac{1}{2} \times 6\frac{1}{2}$	9 x 7	7in. 5 0
„ 6	$8\frac{1}{2} \times 6\frac{1}{2}$	9 x 7	10x8	8in. 6 0
„ 7	9 x 7	10x8	12x10	9in. 7 0
„ 8	10x8	12x10	13x11	10in. 8 0
„ 9	12x10	13x11	15x12	12in. 9 0
„ 10	13x11	15x12	18x16	15in. 10 0
„ 11	15x12	18x16	22x18	18in. 12 0
„ 12	18x16	22x18	25x21	21in. 15 0

RAPID SYMMETRICALS.*

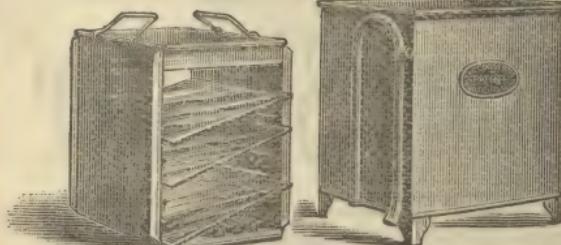
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$8\frac{1}{2} \times 6\frac{1}{2}$..	8 x 5 ..	10½ in. ..	7 10 0
9 x 7 ..	$8\frac{1}{2} \times 6\frac{1}{2}$..	12in. ..	8 10 0
10 x 8 ..	$8\frac{1}{2} \times 6\frac{1}{2}$..	14in. ..	10 10 0
12 x 10 ..	10 x 8 ..	16in. ..	11 10 0
13 x 11 ..	11 x 9 ..	18in. ..	12 10 0
15 x 12 ..	13 x 11 ..	210n. ..	14 10 0
18 x 16 ..	15 x 12 ..	24in. ..	18 10 0
22 x 18 ..	18 x 16 ..	30in. ..	25 0 0
25 x 22 ..	22 x 18 ..	34in. ..	30 0 0

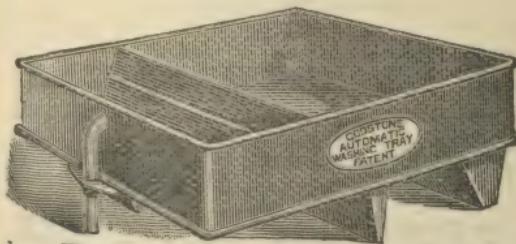
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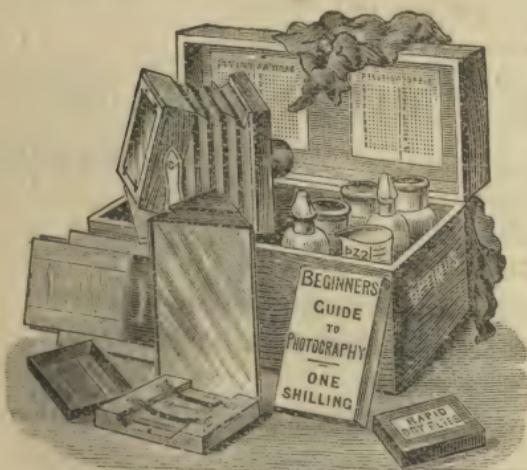
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5 by 4	1 8 -	1 10	2 0	10 by 8	7 0	8 0	9 0
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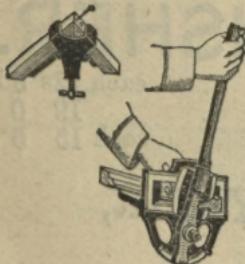
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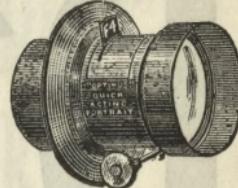
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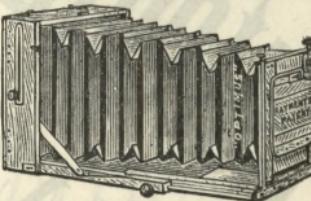
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